

CRF-150

**FM/AM 13-BAND
PORTABLE RADIO**



SONY®
SERVICE MANUAL

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SUPPLEMENT

No. 2
SEPTEMBER, 1970

Subject : 1. Troubleshooting guide

2. Af circuit board changed. Serial No.

USA model 31,800
CANADA model 50,100
GENERAL EXPORT
model 42,420

and later.

1. TROUBLESHOOTING GUIDE

Trouble	Band	Symptom	Cause	Remedy
No sound (Af circuit normal but no sound from speaker.)	MW	1) 0.8 V or higher at the emitter of Q304. (0.6 to 0.7 V is normal)	1) Leaky tuning capacitor.	1) Apply 20 V dc between the rotor and the stator of the tuning capacitor to produce a spark.
		2) No sound even if the bar antenna coil is adjusted.	2) Defective bar antenna coil.	2) Replace the coil.
		3) Collector voltage at Q306 is too low. (2.75 V is normal.)	3) Internal resistance of the tuning meter is too high.	3) Replace the tuning meter.
	SW2~10	No sound at the high-frequency end of each band. Normal sound at the low-frequency end.	Shorted padding capacitors. (C247, C250, C253, C256, C259, C262, C265, C268, C271)	Replace these capacitors.
Low sensitivity	FM	Noise heard during reception.	Antenna lead (coaxial cable) of tuner touches the tuner case.	Resolder the lead.
	SW1	Great difference in noise level between SHARP and BROAD positions of the SELECTIVITY switch.	Yellow lead of the switch is connected to ground.	Resolder the lead.
	SW2~10	Noise heard all over the SW bands.	3.8 to 4.1 V at the emitter of Q309. (4.5 V is normal.)	Adjust R369 for 4.5 V.
Shock noise	FM	1) Shock noise.	1) Shield plate touching the CP printed circuit board.	1) Separate the shield plate from the printed circuit board.
		2) Shock noise.	2) Leads of capacitors mounted on the conductor side are touching the legs of IFTs.	2) Cover the legs of these capacitors with plastic tubing.
	MW	1) Shock noise.	1) Loose contact in the pilot lamp switch.	1) Replace the switch.
		2) Shock noise.	2) Loose nut on the EXT ANT terminal.	2) Tighten nut, then secure with contact cement.

Trouble	Band	Symptom	Cause	Remedy
Oscillation	FM	1) Oscillating noise 2) Oscillating noise 3) Oscillating noise	1) Coupling between L319 and CF301. 2) "S" curve is too sharply adjusted. 3) Leads from the tuner and antenna to S301-2 disturb the i-f stage.	1) Separate L319 from CF301. 2) Lower the "S" curve level. 3) Separate the leads from the printed circuit board.
Tuning meter	FM	Pointer does not move.	Leaky C377 between IFT F301 and S301-8.	Replace C377.
	MW	Minimum pointer movement.	R313 misadjusted.	Readjust R313 for 0.25 to 0.28V at the emitter of Q303.
Wrong dial pointer indication	FM		1) Pointer does not slide properly. 2) Incorrect frequency coverage.	1) Make the pointer slide more smoothly. 2) Readjust the frequency coverage.
	MW	2) Backlash.	1) Incorrect frequency coverage. 2) Loose screw on the double gear.	1) Readjust the frequency coverage. 2) Engage gears, and tighten the screw.
	SW2~10	2) Normal when the core of the second oscillator coil is pulled out.	1) Loose core in the first oscillator coil. 2) Damaged second oscillator coil.	1) Fix the core with an elastic band, or replace the coil. 2) Replace the coil.
Unstable reception	SW2~10	1) No reception when the band selector is turned counterclockwise. Normal reception when the selector is turned clockwise. 2) Reception okay when the set is given a mechanical shock.	1) Faulty or bent contact in the turret tuner. 2) Imperfect solder joint.	1) Repair or straighten the contact. 2) Resolder the defective joint.
Battery current flows when ac power supply is operating.	All	Excessively high voltage at any point in the circuit.	Shorted D502.	Replace D502.
Reverse operation of the SELECTIVITY switch.	LW	Reverse operation on the low frequency range.	Ground foil between CF302 and CF303 is cut.	Connect the cut foil with a jumper lead.
FM tuning shaft gear skips.	FM	Tight dial	Defective gear	Deepen gear teeth, and apply lubricating oil.

SECTION 1

TECHNICAL DESCRIPTION

1-1. SPECIFICATIONS

Circuit System:	2-FET, 19-transistor, 12-diode superheterodyne	
Frequency Coverage:	FM: 87 – 108 MHz (3.44 – 2.78m) MW: 530 – 1,605 kHz (566 – 187m) LW: 150 – 400 kHz (2,000 – 750m) SW1: 1.6 – 4.5 MHz (187 – 67m) SW2: 4.7 – 5.3 MHz (64 – 57m) SW3: 5.8 – 6.4 MHz (52 – 47m) SW4: 7.0 – 7.6 MHz (43 – 39m) SW5: 9.5 – 10.1 MHz (31.6 – 30m) SW6: 11.6 – 12.2 MHz (26 – 24.6m) SW7: 15.0 – 15.6 MHz (20 – 19.2m) SW8: 17.5 – 18.1 MHz (17 – 16.5m) SW9: 21.4 – 22.0 MHz (14 – 13.8m) SW10: 25.5 – 26.1 MHz (11.8 – 11.5m)	
Intermediate Frequency:	FM: 10.7 MHz MW, LW, SW1: 455 kHz SW2 – SW10: 1st: 1.55 – 2.26 MHz 2nd: 455 kHz	
Antenna System:	FM: telescopic antenna or external antenna (impedance 300 Ω) MW, LW: built-in ferrite bar antenna or external antenna (high impedance) SW1: telescopic antenna or external antenna (high impedance) SW2 – SW10: telescopic antenna or external antenna (impedance 75 Ω)	
Maximum Sensitivity:	FM: 1 μ V (0dB) MW: 25.1 μ V/m (28 dB/m) LW: 39.8 μ V/m (32 dB/m) SW1: 1 μ V (0dB) SW2 – SW10: 1 μ V (0dB)	
Selectivity:	40 dB at 1,400 kHz \pm 10 kHz off resonance	
Power Requirement:	Six "D" size flashlight batteries 9 volts in total, or house current (ac 100V, 117V, 220V, 240V)	
Power Output at 10% distortion:	2.7W (with ac power supply), 1.1W (with battery) maximum: 3.8W (with ac power supply), 1.7W (with battery)	
Current Drain at zero signal:	78 mA (with ac power supply), 35 mA (with battery)	
AUX IN:	Impedance: $\infty\Omega$	
MPX OUT:	Impedance: 5.1 k Ω Level: -40 dB 10 dB = 0.775V	
Record Out:	Impedance: 10 k Ω Level: -60 dB (0 dB = 0.775V)	
Speaker:	3 $\frac{1}{2}$ " (8 cm) \times 6 $\frac{1}{4}$ " (16 cm), 4 Ω	
Dimensions:	13 $\frac{3}{8}$ " (W) \times 10 $\frac{11}{16}$ " (H) \times 5 $\frac{11}{16}$ " (D) (340 mm \times 275 mm \times 144 mm)	
Weight:	15 lb 7 oz (7 kg)	

1-2. TECHNICAL FEATURES

- * High-performance portable radio receiver with thirteen bands; FM, MW, LW, SW1-SW10.
- * FET (field effect transistor) with triple-tuned passive input circuit for superior interference rejection.
- * High-sensitivity and selectivity on SW bands using double-superheterodyne front end.
- * High-fidelity af amplifier with OTL circuit.
- * Choice of three power sources; house current, battery, car battery.

1-3. CIRCUIT DESCRIPTION

Stage/control

Function

Fm Tuner

FET mixer Q101

Usually an fm front end consists of an rf amplifier, mixer and local oscillator as shown in Fig. 1-1.

The rf amplifier sometimes worsens the crossmodulation handling ability of the receiver when ordinary bipolar transistors are used. It is, however, difficult to eliminate the rf amplifier because its removal causes strong spurious radiation, poor sensitivity, and a poor noise figure. To solve this problem, the Model

Local oscillator Q102

CRF-150 uses a low-noise junction FET for the mixer and a triple-tuned passive input circuit as shown in Fig. 1-2. The Model CRF-150 is capable of clear fm reception even in strong signal-strength areas due to the extremely superior interference-rejection characteristics of the passive input circuit.

The oscillator generates a frequency 10.7 MHz higher than the incoming signal frequency and injects the generated voltage at the source of FET mixer Q101.

Afc diode D101

This diode is connected across the resonant circuit of the oscillator and works as a variable-capacitance diode. A dc feedback voltage from the discriminator controls the bias applied to the diode to keep the local oscillator frequency correct.

Fm i-f amplifier Q103

Transistor Q103 amplifies the 10.7 MHz i-f signal produced by mixer Q101 and coupled to it through i-f transformer IFT 101.

Sw Tuner

Double- superheterodyne

A block diagram of the sw front end is shown in Fig. 1-3. Such an arrangement effectively suppresses image signals, since the high value of the first i-f causes the desired and image signals to differ greatly in frequency. At the same time, the relatively low value of the second i-f makes it possible to obtain high amplification as well as sharp discrimination against signals differing only slightly in frequency from the desired signal.

The result is that this double-superheterodyne front end provides a combination of greater image suppression and higher adjacent channel-selectivity than can be realized in a simple superheterodyne receiver.

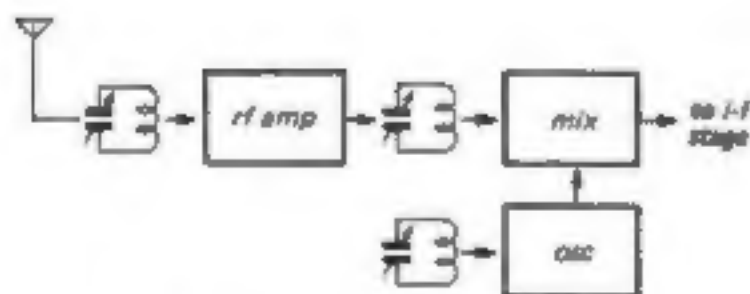


Fig. 1-1 Usual fm front end

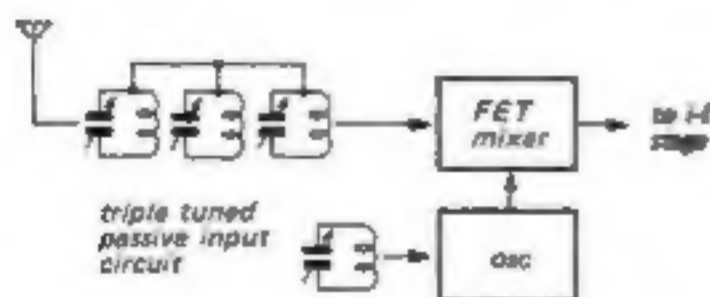


Fig. 1-2 CRF-150 fm front end

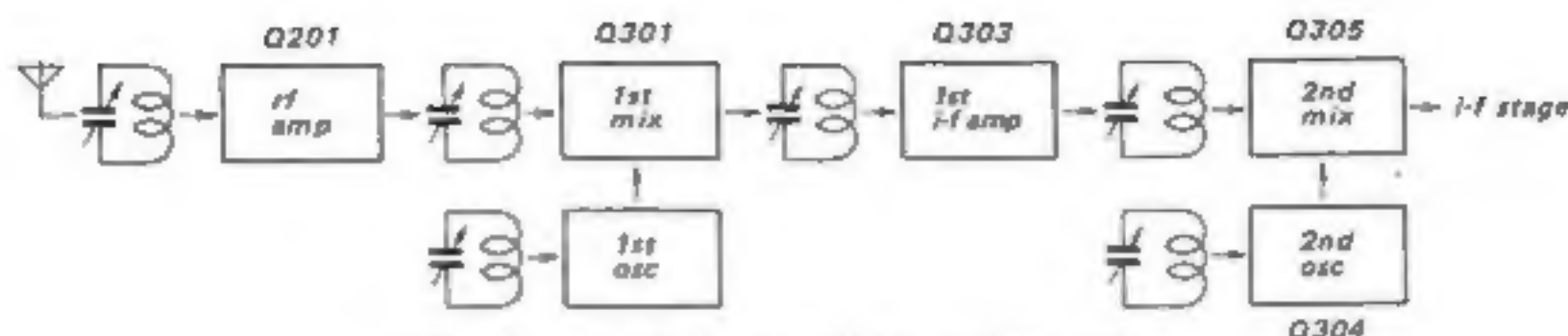


Fig. 1-3 Block diagram of the sw front end

Agc amp
Q202
D302

The agc (automatic gain control) circuit consists of transistor Q202 and diode D302. The carrier from the last stage of the i-f amplifier adds a negative agc voltage on the positively-biased base of transistor Q202 through diode D302 as shown in Fig. 1-4.

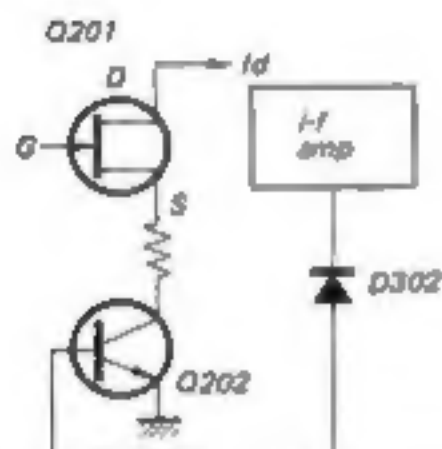


Fig. 1-4 Diagram of the agc

As the signal becomes stronger, the agc level becomes higher also.

Accordingly, the collector-current of Q202 and the drain-current of Q201 decrease. If the signal is small, Q202 increases the gain of rf amplifier Q201 and the desired sensitivity is obtained as shown in Fig. 1-5. In this way, the gain is controlled automatically.

The oscillator generates a frequency 1.55 – 2.25 MHz higher than the incoming signal frequency, and injects the generated voltage at the emitter of Q301. The oscillator frequencies are fixed in each band.

1st local
oscillator
Q203

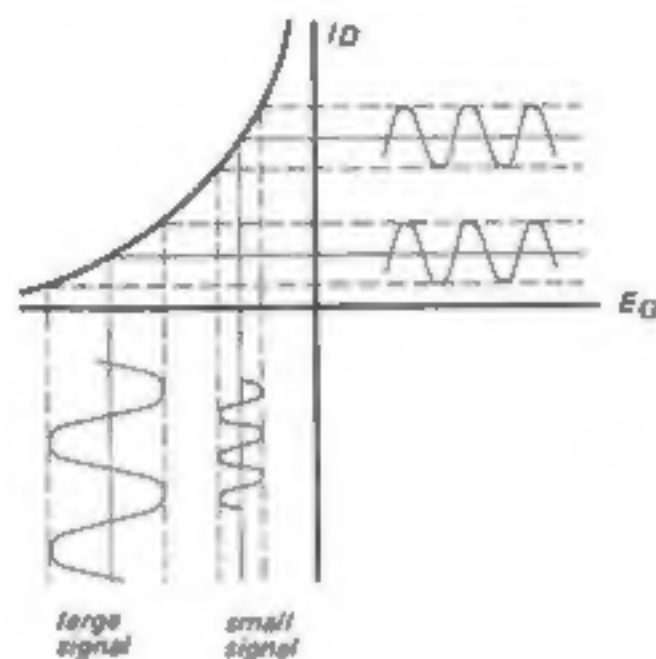


Fig. 1-5 Output waveform of the agc

I-F Strip

1st mixer
Q301

Q301 combines the signal applied to its base with the oscillator voltage (1.55 – 2.25 MHz higher than incoming signal) applied to its emitter for conversion to the 1.55 – 2.25 MHz 1st i-f.

SW 1st i-f
amplifier

Q303 amplifies three a-m signals; 1.55 – 2.25 MHz (SW1 – SW10), 520 – 1,670 kHz (MW), and 145 – 410 kHz (LW).

MW, LW rf
amplifier
Q303

2nd oscillator
Q304

Q304 generates a frequency 455 kHz higher than the signals that come from Q303.

Fm i-f
amplifier
Q302

Q302 amplifies the 10.7 MHz fm i-f signal coupled through ceramic filters CF301 and CF302. Also, the saturation due to high base to emitter bias clips the negative peak of the ac signal voltage developed at the collector of Q302.

**Limiter
D301** This diode clips the positive peak of ac signal voltage developed at the collector of Q305.

**Fm i-f
amplifier** Q305 amplifies 10.7 MHz fm i-f signal. Also, Q305 produces a 455 kHz a-m i-f signal on its collector.

**A-m 2nd mixer
Q305**

Power Supply

The CRF-150 uses a 4-pin ac cord for its power supply and has a power-in jack for a house current 100V, 117V, 220V and 240V (for USA model 117V only). However, by using the SONY DCC-2A Car Battery Cord or standard flashlight batteries (six size "D" cells), the CRF-150 can be operated away from an ac power outlet. Though diode D502 prevents a reverse current flow through the batteries when using a house current or car battery, it is better to remove the flashlight batteries if they will not be used for a while.

Sensitivity Selector

The stage selectivity is obtained by using a ceramic filter (CF304) as a frequency-selective by-pass centered at 455 kHz. This gives transistor Q304 a high gain at 455 kHz by preventing emitter degeneration of the signal at this frequency. By connecting capacitor C372 in parallel with filter CF304 (See Fig. 1-6), the BROAD selectivity bandwidth is obtained. When the SHARP position is set, the bandwidth becomes narrow. However, greater sensitivity with less noise is obtained and a weak signal can easily be heard.

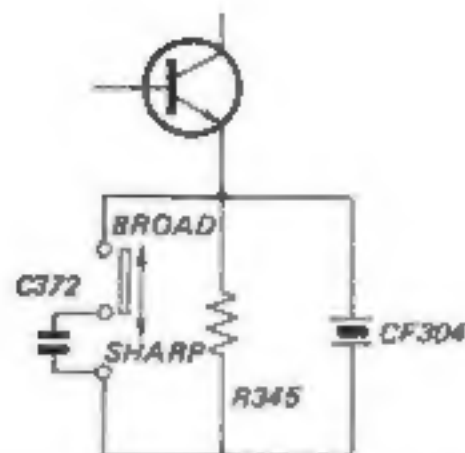


Fig. 1-6 Selectivity selection circuit

Audio Amplifier

**VOLUME control
VR601** The level of signal applied to the power amplifier is determined by the setting of VR601.

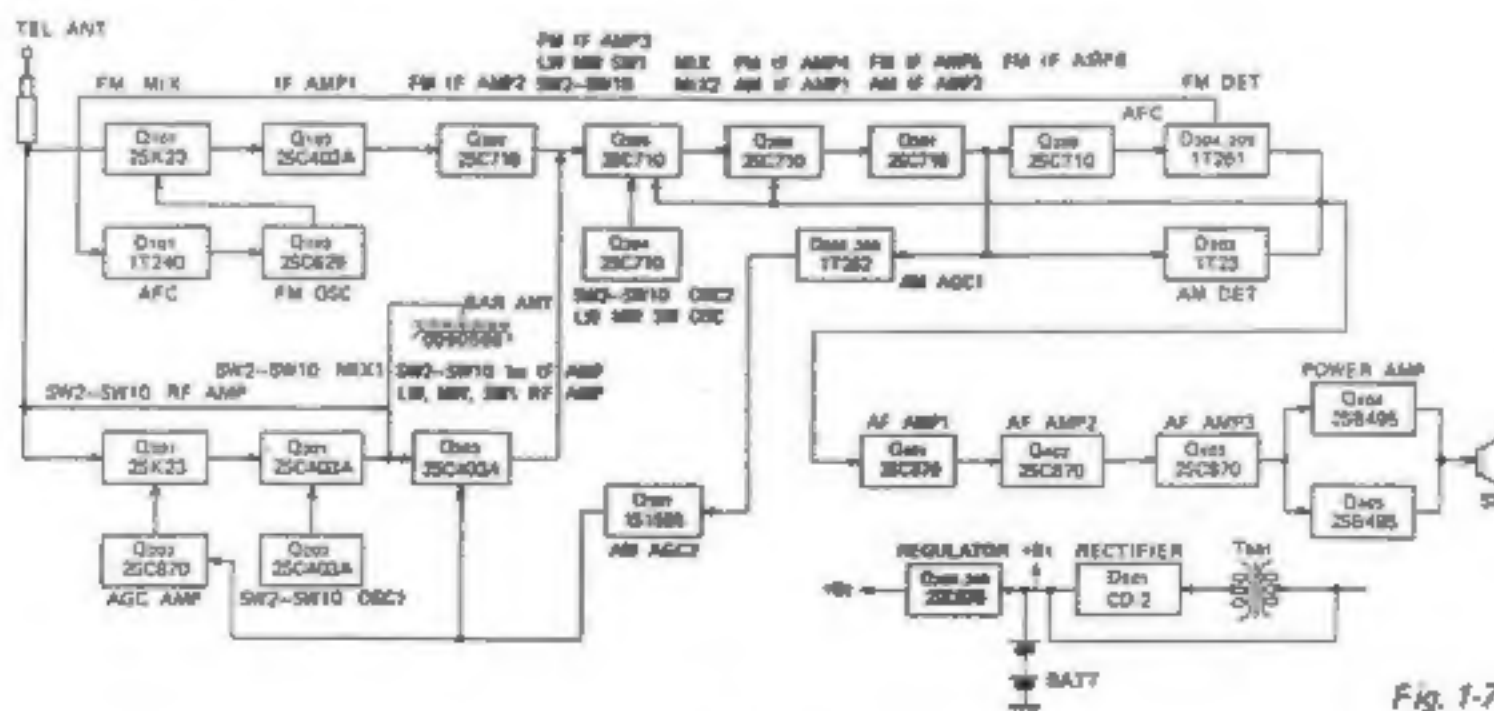
**Amplifier
Q401** Transistor Q401 amplifies the audio signal supplied by VOLUME control VR601.

**Audio driver
Q402, Q403** These direct-coupled stages amplify the audio signal supplied by TREBLE control VR602 and BASS control VR603.

**Power amplifier
Q404, Q405** This stage uses an OTL (output transformerless) push-pull class-B amplifier. Thermistors CS401 and CS402 temperaturecompensate the base bias of Q404 and Q405.

Negative feedback from the output of Q404 and Q405 to the emitter of Q403 improves the frequency response and reduces distortion.

1-4. BLOCK DIAGRAM



1-6. EXTERNAL VIEW

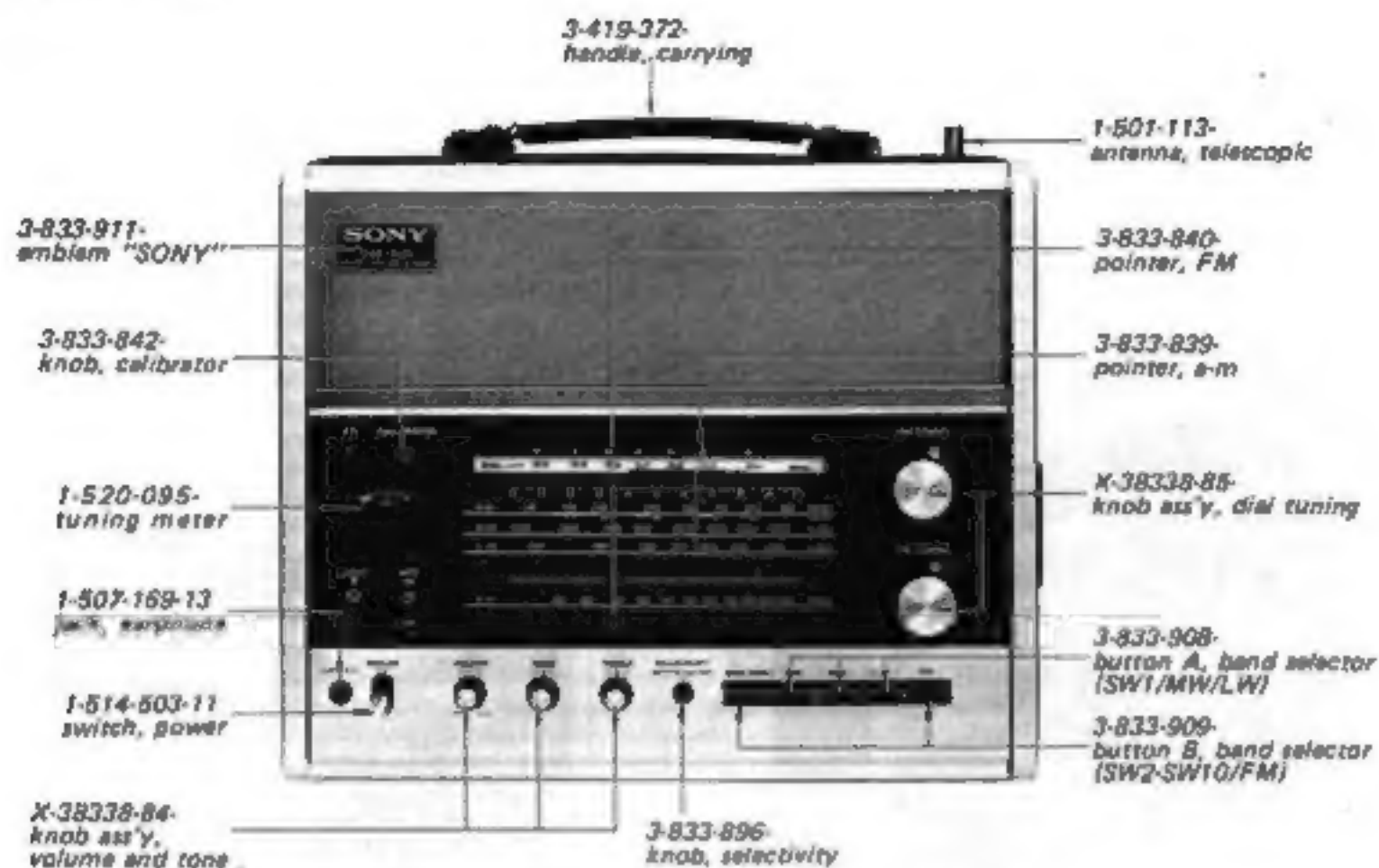


Fig. 1-8

1-6. MAJOR PARTS LOCATION

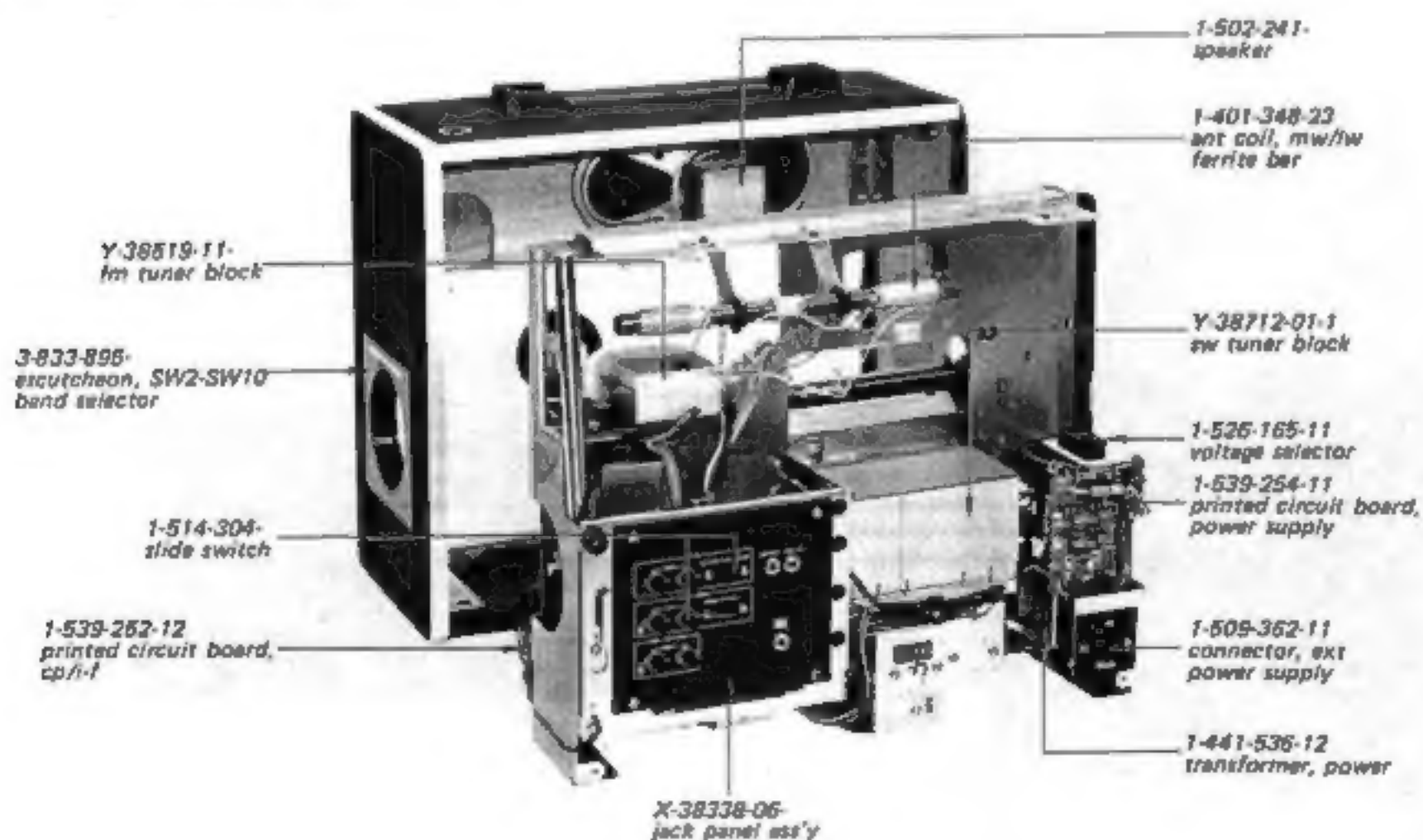


Fig. 1-9

SECTION 2 DISASSEMBLY

2-1. CHASSIS REMOVAL

1. Pull off the six knobs shown in Fig. 2-1.
2. Remove the two screws and carrying handle as shown in Fig. 2-1.

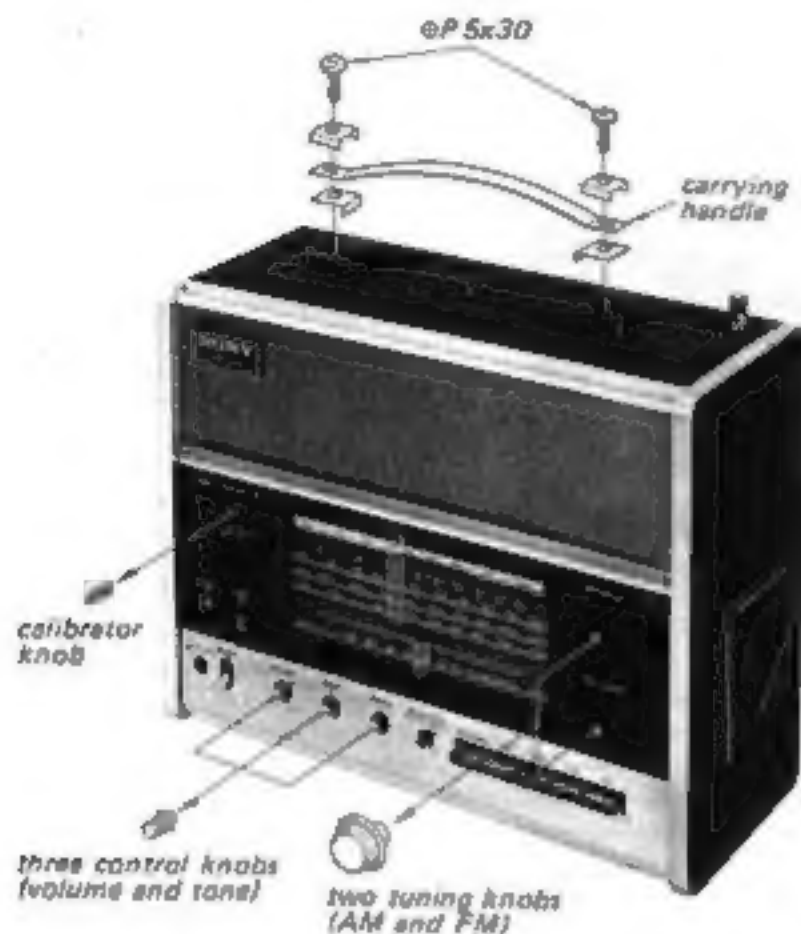


Fig. 2-1

5. Remove the four screws marked Δ which fasten the front panel to the chassis in Fig. 2-3.
6. Loosen a screw marked \circ and remove the telescopic antenna.
7. Remove the speaker socket as shown in Fig. 2-3.
8. Now, the front panel is removable as shown in Fig. 2-4.
9. Remove the three screws and two rubber feet as shown in Fig. 2-4.



Fig. 2-3

3. Remove the battery lid and take out batteries and ac cord.
4. Remove the three screws shown in Fig. 2-2.

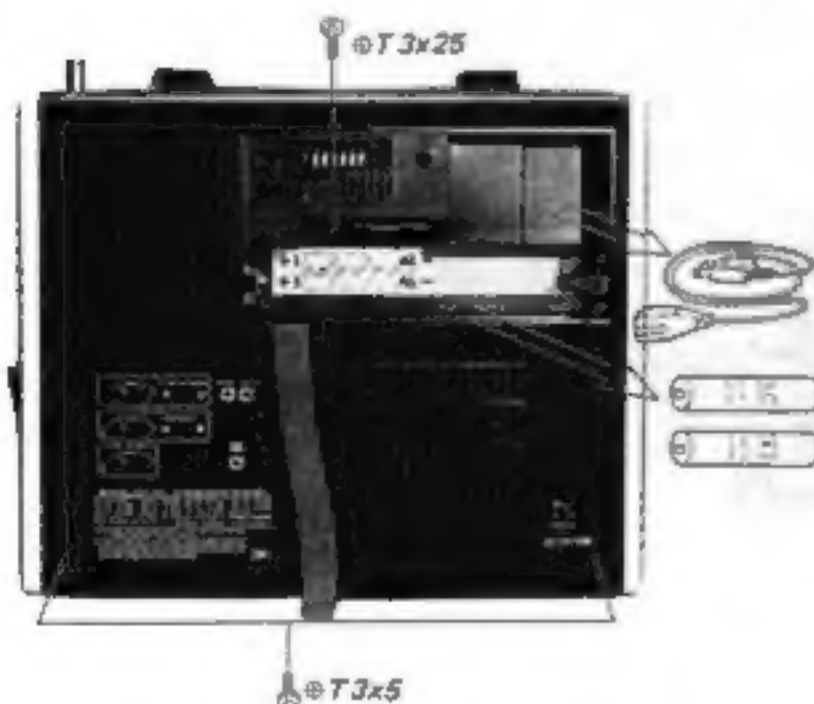


Fig. 2-2

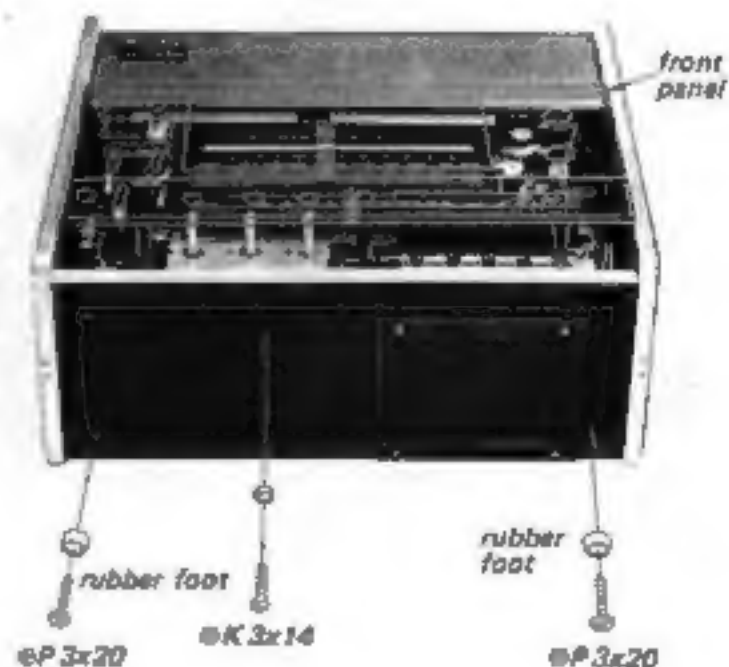


Fig. 2-4

10. Loosen the three screws and pull off the sw band selector knob as shown in Fig. 2-5
11. Now, the chassis is removable as shown in Fig. 2-6

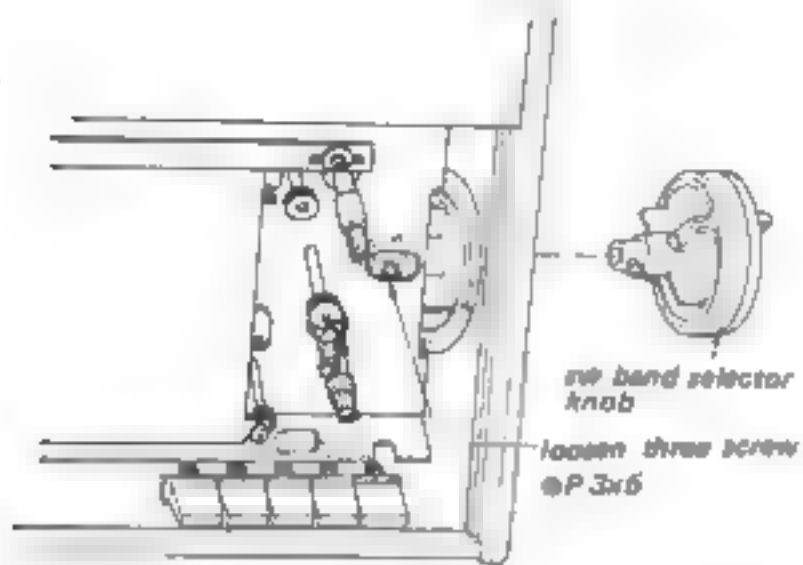


Fig. 2-5

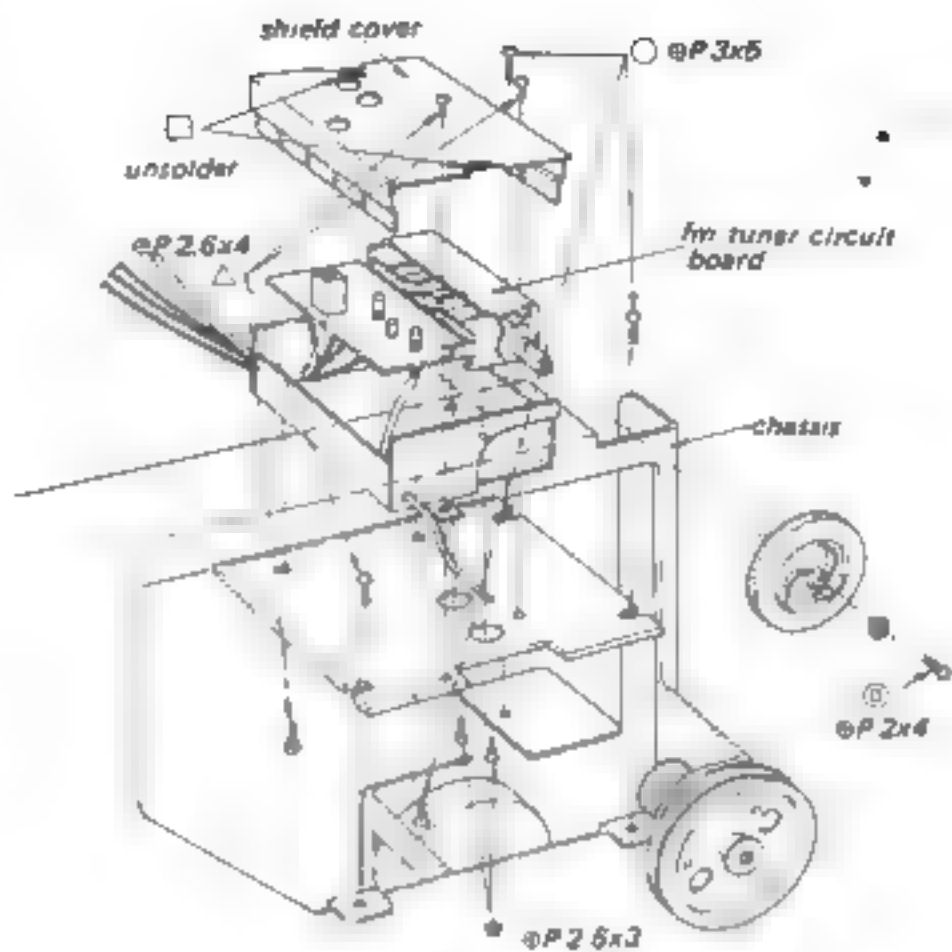


Fig. 2-7

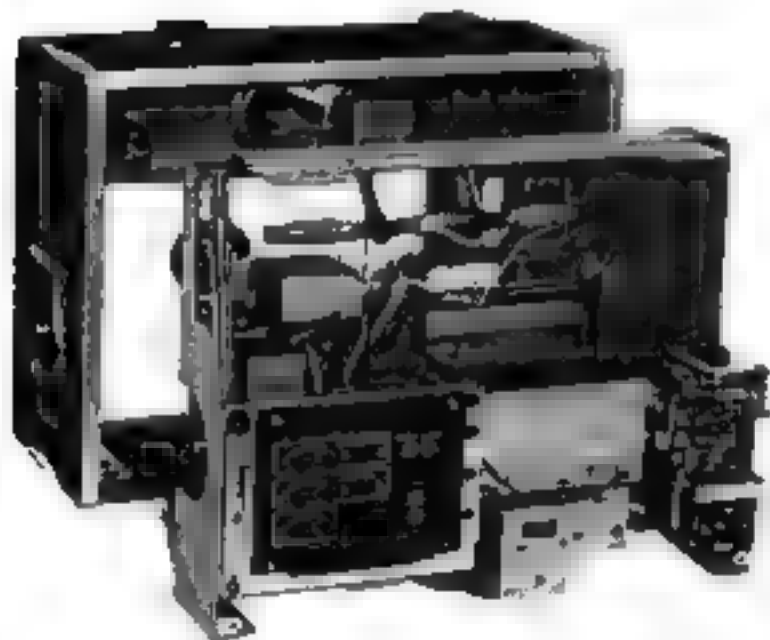


Fig. 2-6

2-2. FM TUNER REMOVAL

1. Remove the chassis.
2. Remove the seven screws marked \circ and Δ in Fig. 2-7
3. Remove the two screws marked \star
4. Remove the screw marked \odot
5. Unsolder the two soldered portions on the shield cover marked \square
6. Take out the shield cover and fm tuner circuit board as illustrated in Fig. 2-7.

2-3. SW TUNER REMOVAL

1. Remove the chassis
2. Unsolder the ten lead wires shown in Fig. 2-8

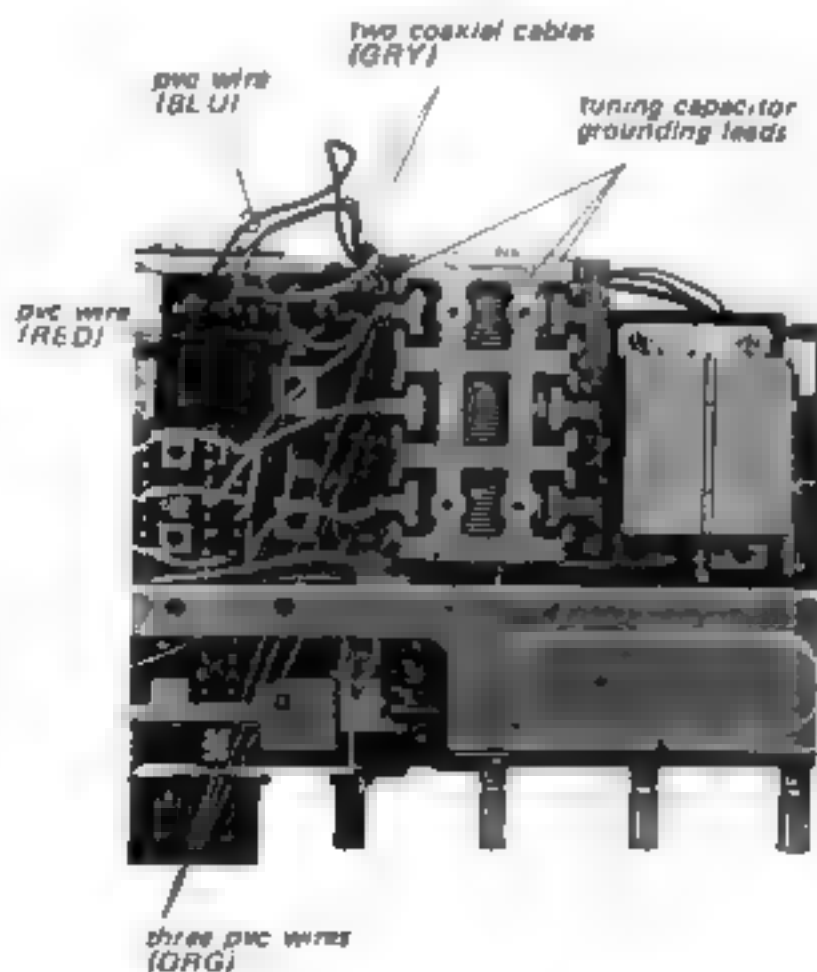


Fig. 2-8

- 3 Remove the five screws and the shield cover as shown in Fig. 2-9 and unsolder the two lead wires
- 4 Loosen the four screws marked (
- 5 Now, sw tuner block is removable in the direction shown by the arrow

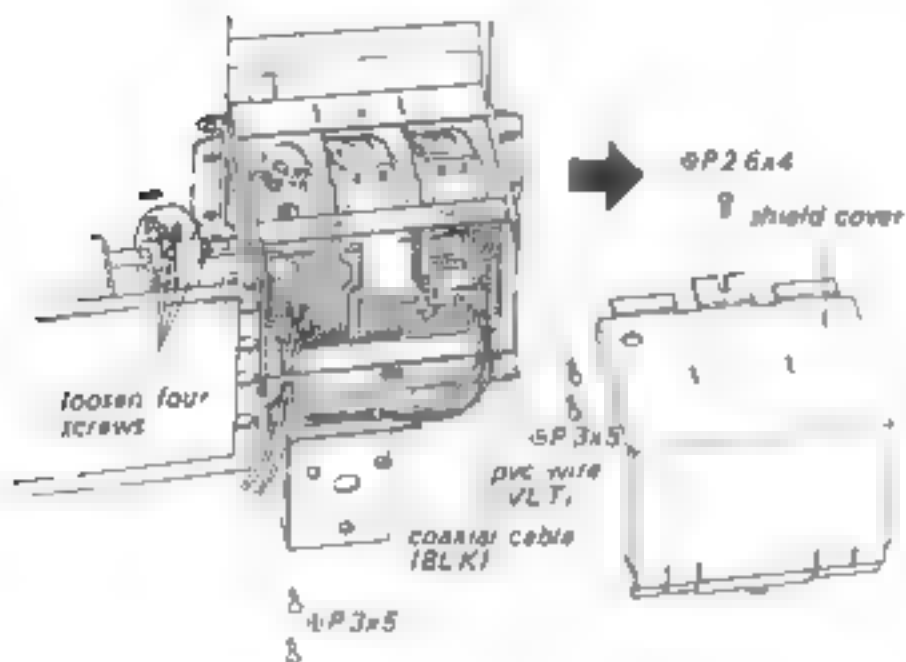


Fig. 2-9

2-4. CP/IF CIRCUIT BOARD REMOVAL

- 1 Unsolder the same ten lead wires in Fig. 2-8 as sw tuner removal.
- 2 Unsolder the six lead wires at ferrite bar antenna as shown in Fig. 2-10.

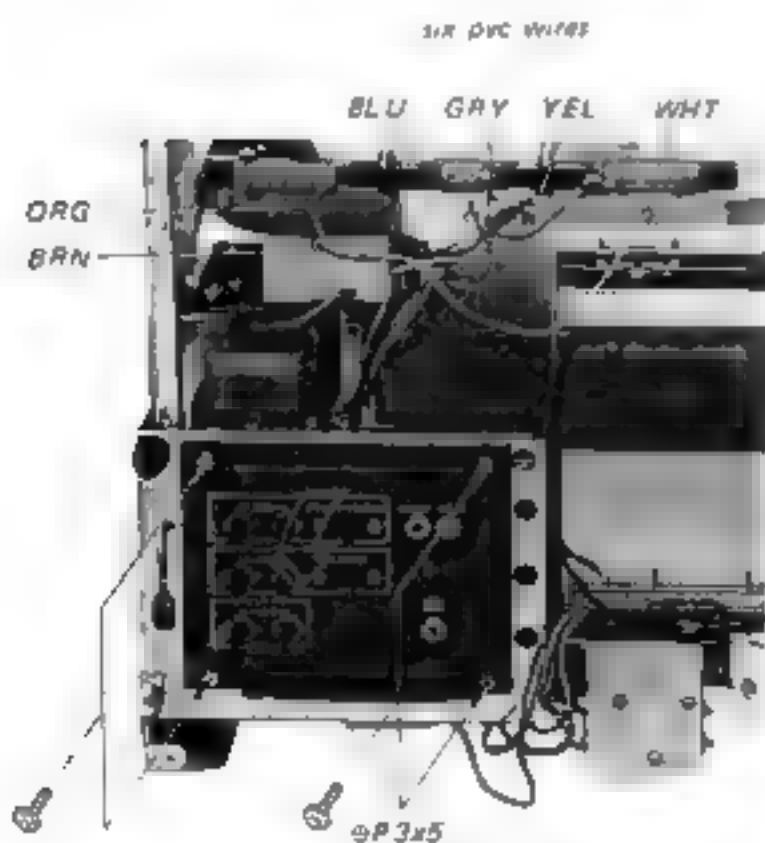


Fig. 2-10

- 3 Remove the four screws at the jack panel as illustrated in Fig. 2-10 and unsolder the six lead wires shown in Fig. 2-11
- 4 Remove the three screws shown in Fig. 2-12.
- 5 Unsolder the three lead wires
- 6 Loosen the four lead wires from the lead wire holding lug.
- 7 Slide off the CP/IF circuit board in the direction shown by the arrow in Fig. 2-12

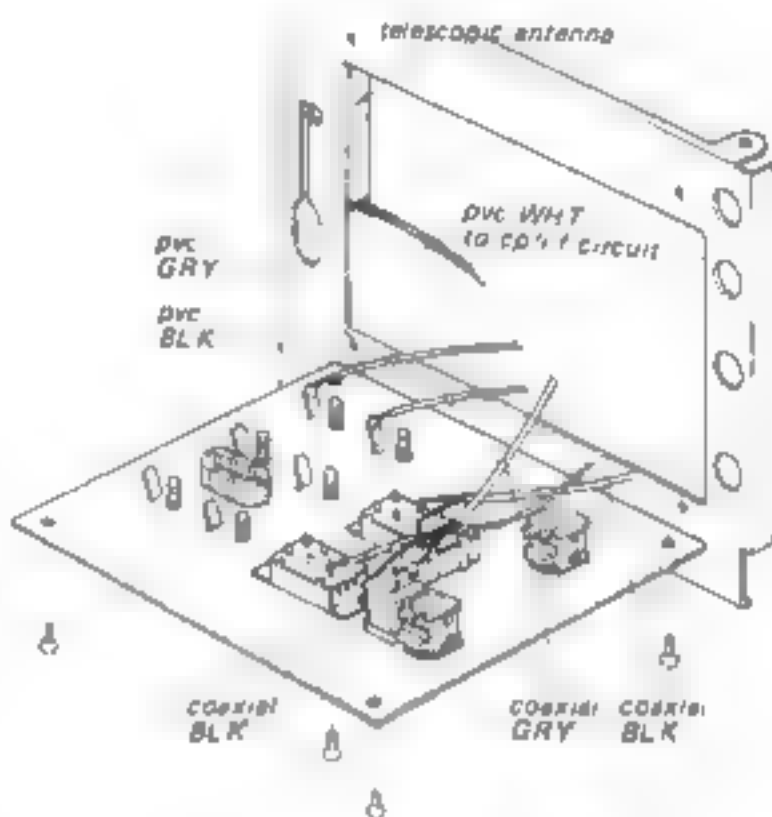


Fig. 2-11

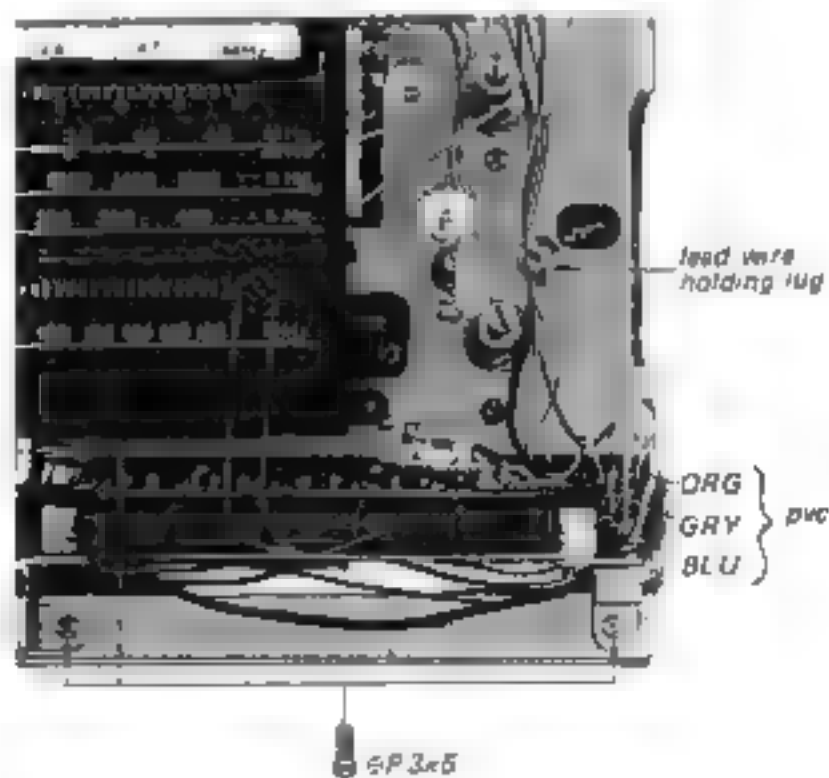


Fig. 2-12

2-5. POWER SUPPLY CIRCUIT BOARD REMOVAL

- 1 Remove the two screws shown in Fig 2-13.
- 2 Turn the circuit board in the direction shown by the arrow.

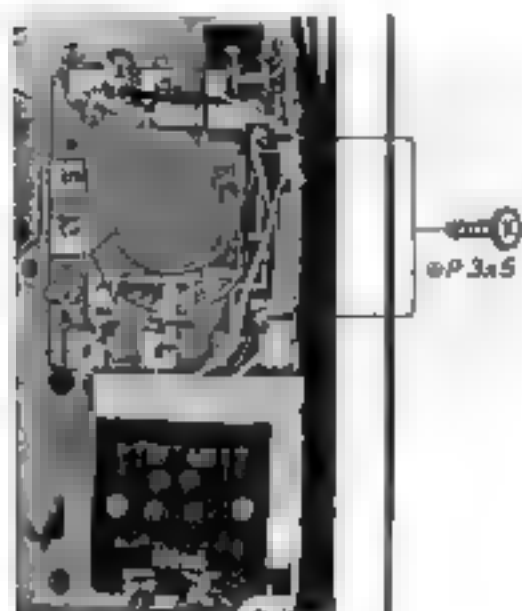


Fig. 2-13

2-6. AF CIRCUIT BOARD REMOVAL

- 1 Remove the four screws shown in Fig 2-14
- 2 Remove the circuit board in the direction shown by the arrow

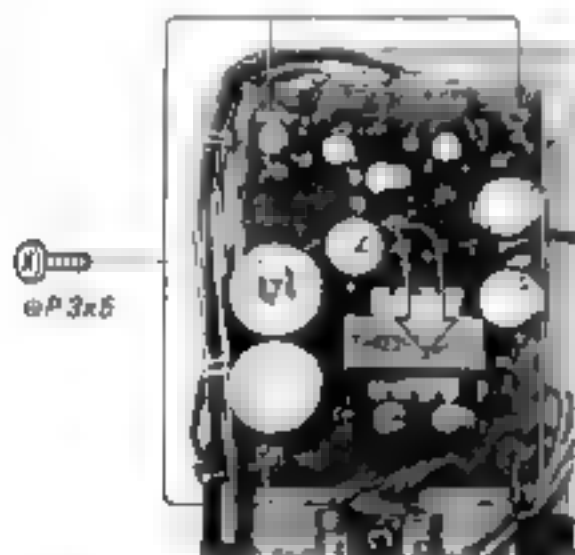


Fig. 2-14

2-7. DIAL SCALE AND DIAL DRUM REMOVAL

- 1 Remove the chassis.
- 2 Remove the four screws shown in Fig 2-15
- 3 Release the pointers from dial cords.

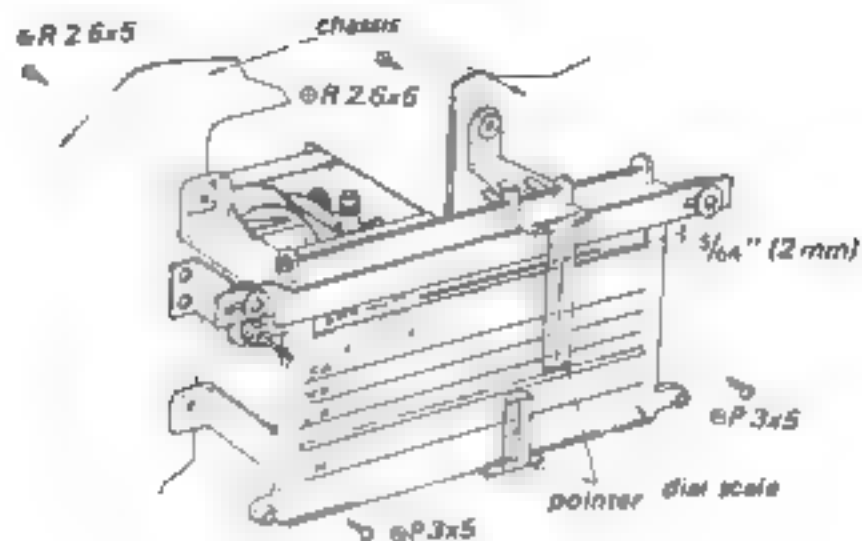


Fig. 2-15

- 4 Remove the dial scale
- 5 Remove the drum holder A by removing the two screws marked \odot in Fig. 2-16
- 6 Release the two screws marked \odot in Fig. 2-16.
- 7 Pull the dial drum towards you

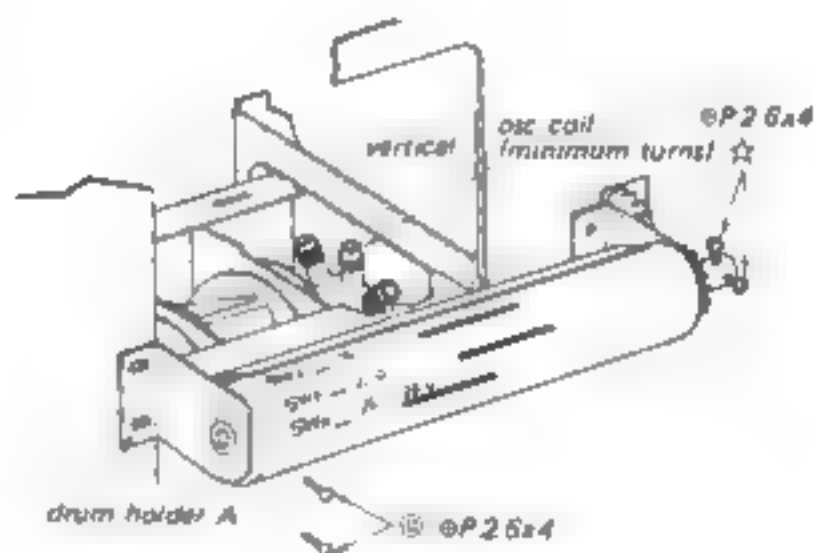


Fig. 2-16

Dial Drum Reassembly

- 1 Turn the sw band selector so that the osc coil which has the minimum turns comes to the vertical position as shown in Fig. 2-16.
- 2 Attach the dial drum to the drum holders setting the two screws marked \odot in Fig. 2-16.
- 3 Set the dial scale.
- 4 Turn the dial drum so that the drum indicates SW10 and the distance between the dial scale and the line on the drum becomes $3/64$ inches (2mm) as shown in Fig. 2-15
- 5 Fasten the two screws marked \odot in Fig. 2-16.

2-8. DIAL CORD RESTRINGING

Preparation

1. Remove the chassis.
2. Remove the four screws shown in Fig. 2-17 and take out the dial scale.
3. Remove the volume holder by removing the two screws as shown in Fig. 2-18.

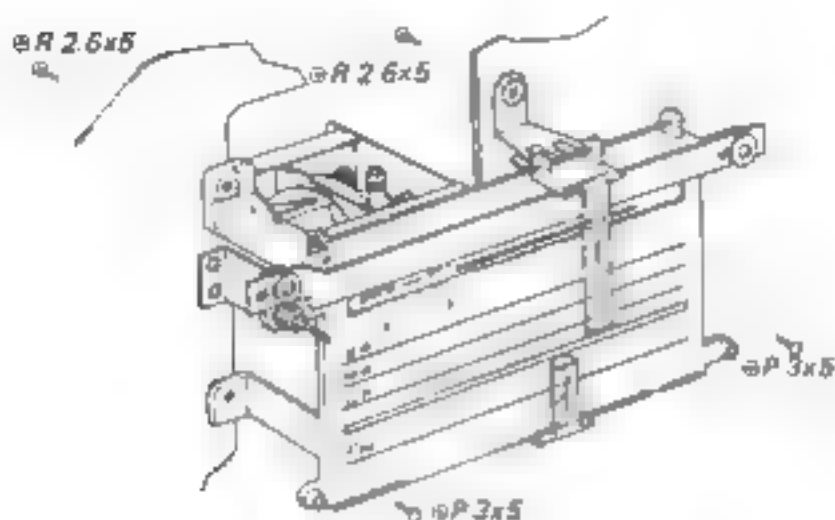


Fig. 2-17

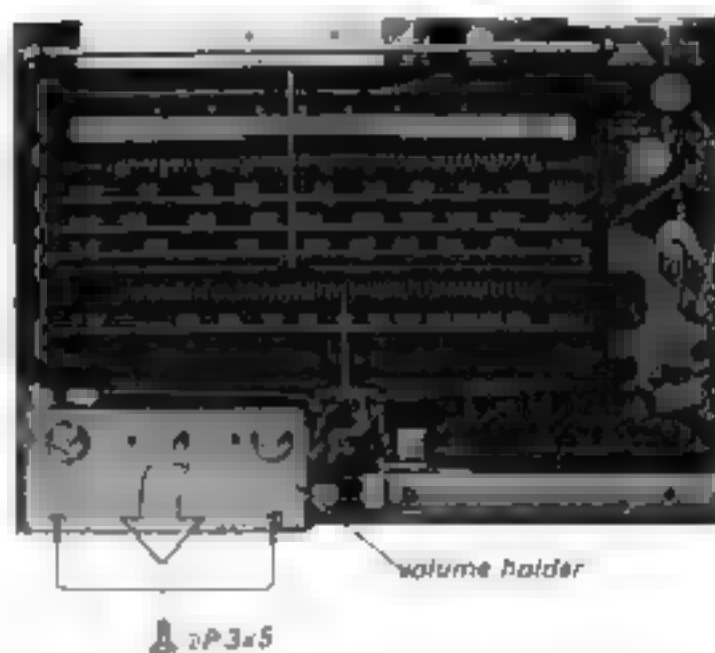


Fig. 2-18

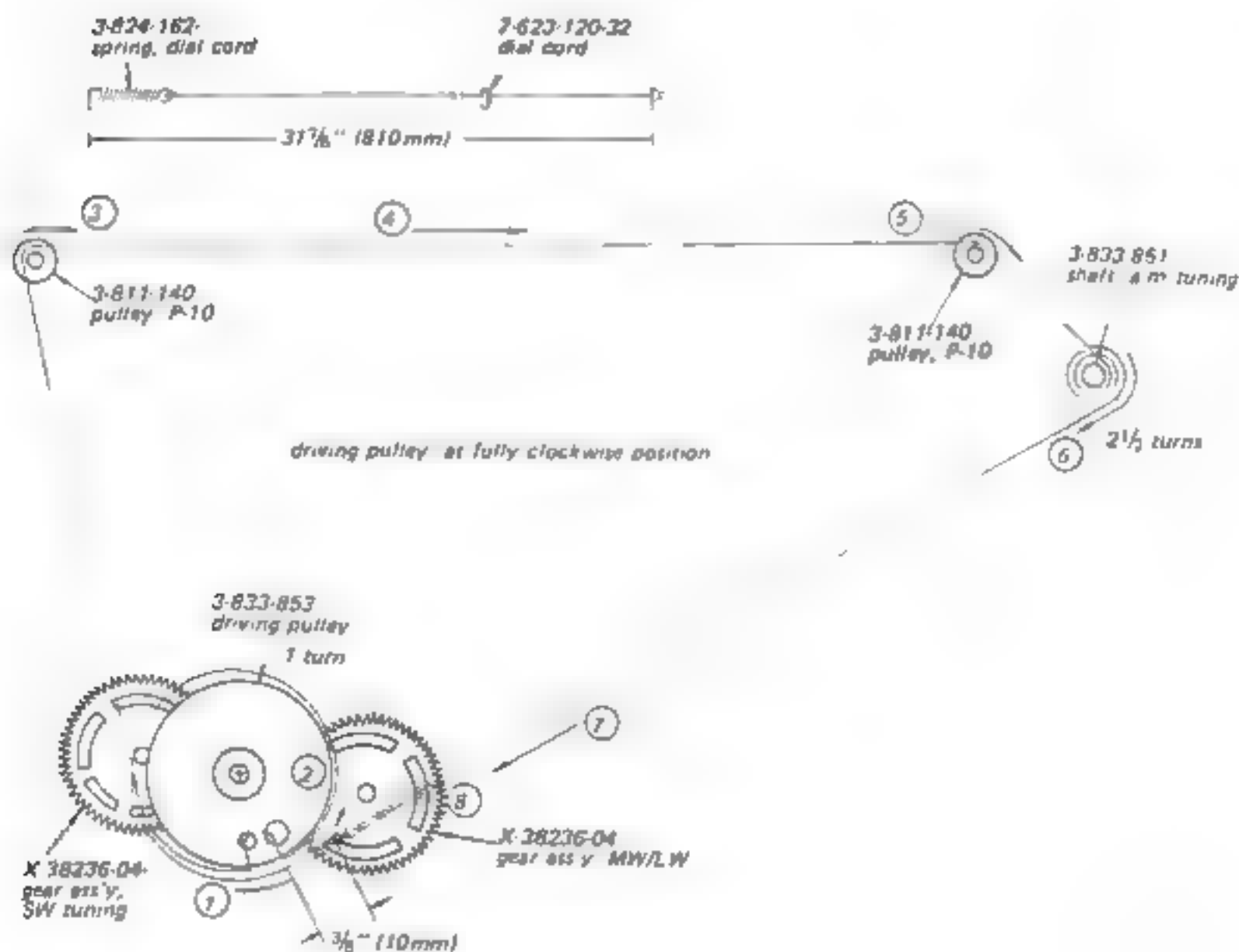


Fig. 2-19

2. Fm Tuning Capacitor Driving Cord

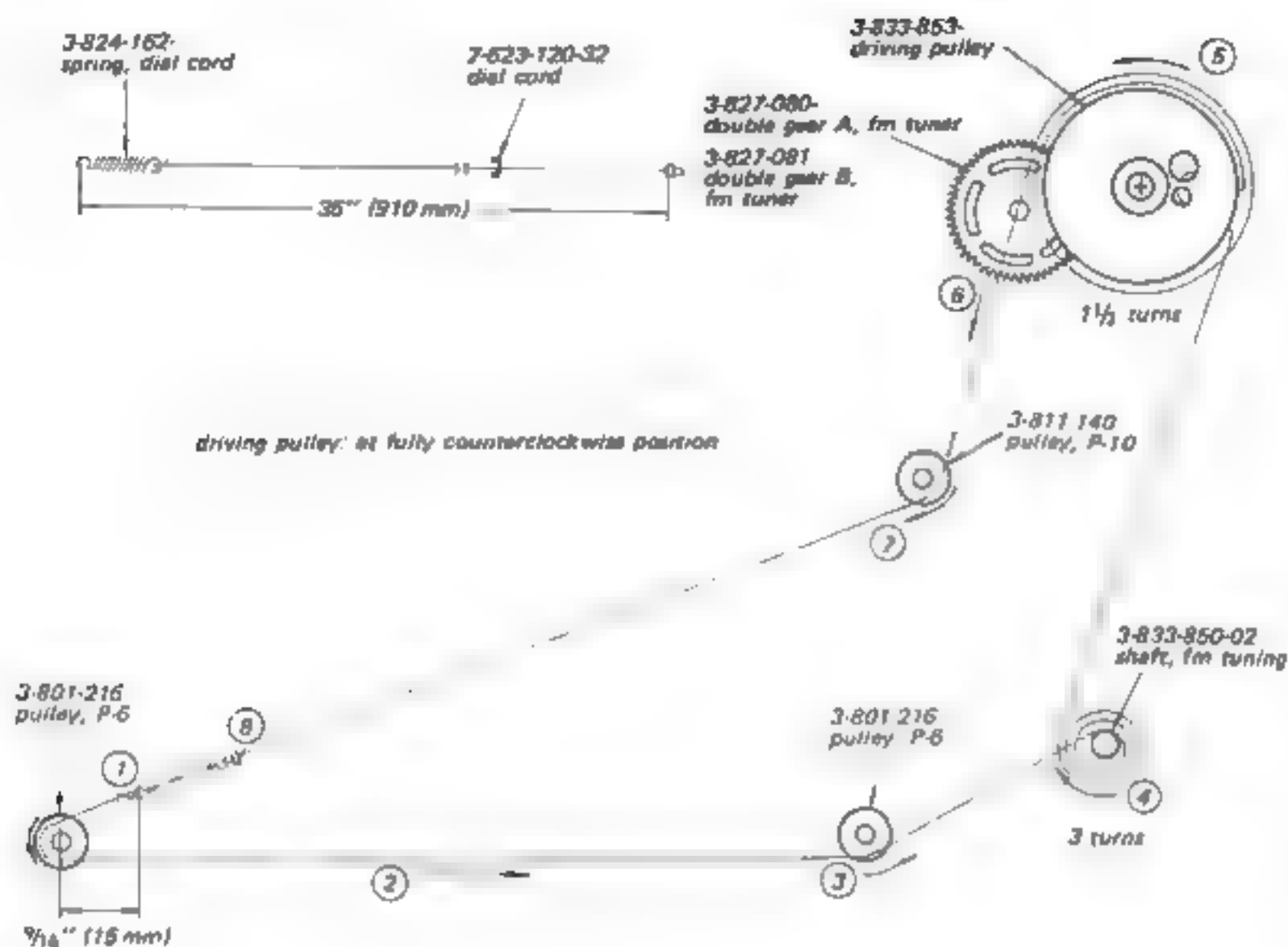


Fig. 2-20

3. Pointer Setting

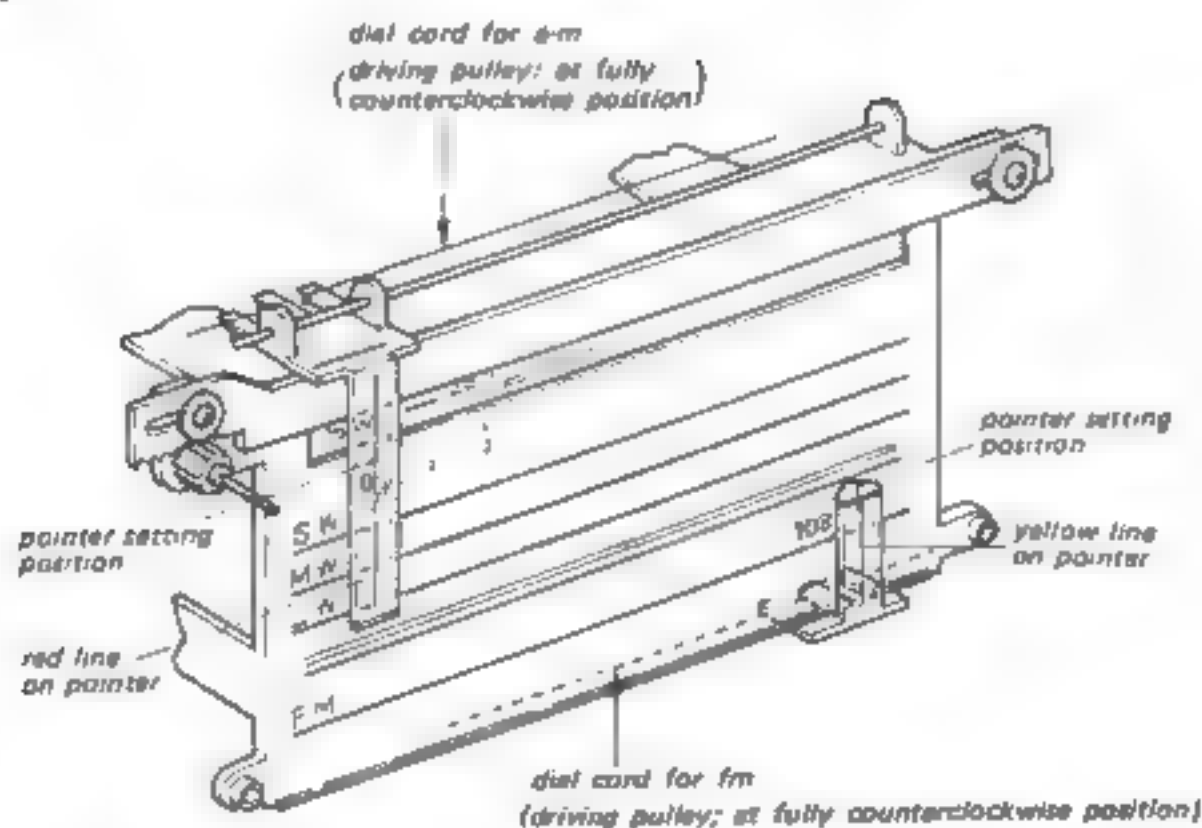


Fig. 2-21

SECTION 3 ADJUSTMENT PROCEDURES

3-1. IF ALIGNMENT

Test Equipment/Tools Required 10.7 MHz Sweep Generator
Rf signal generator (for fm and a-m)
Oscilloscope
VTVM
Loop antenna
Screw driver for alignment

1. FM IF ALIGNMENT

Preparation: Band selector: FM
AFC: OFF
Selectivity: SHARP
Local/DX: DX

Sweep Generator Coupling	Sweep Generator Frequency	Oscilloscope Connection	Adjust	Remarks
Direct connection to EXT ANT 300 Ω (See Fig. 3-1.)	10.7 MHz	MPX OUT jack	IFT F101 IFT F301 IFT F302 IFT F303 IFT F304	Adjust for maximum amplitude and symmetrical "S" curve on the scope (See Fig. 3-2) Ant. Switch EXT ANT

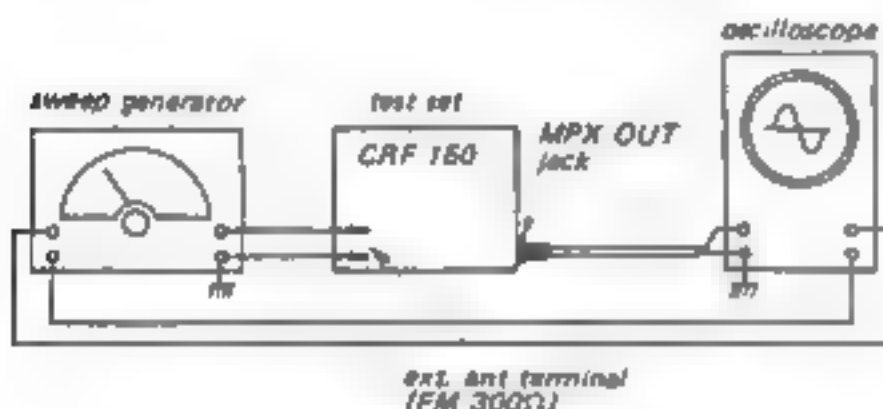


Fig. 3-1 Fm i-f alignment setup



Fig. 3-2 "S" curve on oscilloscope

2. AM IF ALIGNMENT

Preparation: Band selector: MW
Tuning Capacitor: minimum capacitance position

Rf Signal Generator Coupling	Rf Signal Generator Frequency	VTVM Connection	Adjust	Remarks
Loop antenna (See Fig. 3-3)	455 kHz (1 kHz 30% a-m modulated)	MPX OUT jack	IFT A301	Adjust for maximum meter reading.

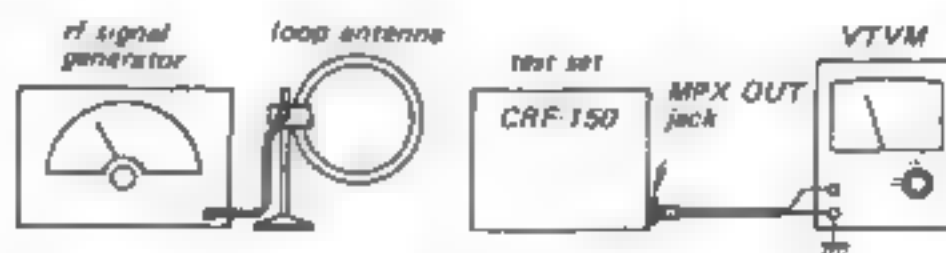


Fig. 3-3 A-m i-f alignment, MW/LW frequency coverage and tracking adjustment setup

3-2. FREQUENCY COVERAGE AND TRACKING ADJUSTMENT

Preparation: VTVM Connection: To MPX OUT jack
 Modulation FM 400 Hz \pm 22.5 kHz frequency-modulated signal
 AM 1 kHz 30% amplitude-modulated signal
 AFC OFF
 Selectivity SHARP

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
FM Frequency Coverage	Direct connection to ext. ant. terminal FM 300Ω See Fig. 3-4	85.5 MHz	Fully left	FM osc coil L104	Band Selector FM Ant Switch: EXT Adjust for maximum meter reading.
		109.5 MHz	Fully right	FM osc trimmer CT1-4	
FM Tracking	The special test equipment required for this adjustment makes this strictly a factory adjustment.				
MW Frequency Coverage	Loop antenna See Fig. 3-3.	520 kHz	Fully left	MW osc coil L312	Band Selector MW Adjust for maximum meter reading.
MW Tracking		1,650 kHz	Fully right	MW osc trimmer CT309	
		620 kHz	Tune to 620 kHz signal	MW ant coil L304-1 MW rf coil L308	
		1,400 kHz	Tune to 1,400 kHz signal	MW ant trimmer CT301-2 MW rf trimmer CT305	
LW Frequency Coverage	— ditto —	145 kHz	Fully left	LW osc coil L313	Band Selector LW Adjust for maximum meter reading.
LW Tracking		410 kHz	Fully right	LW osc trimmer CT310	
		160 kHz	Tune to 160 kHz	LW ant coil L304-2 LW rf coil L309	
		380 kHz	Tune to 380 kHz	LW ant trimmer CT301-3 LW rf trimmer CT306	
SW1 Frequency Coverage	Direct connection to ext. ant. terminal See Fig. 3-5.	1.55 MHz	Fully left	SW1 osc coil L311	Band Selector SW1 Unsolder a blue lead shown in Fig. 3-6. Adjust for maximum meter reading.
SW1 Tracking		4.6 MHz	Fully right	SW1 osc trimmer CT308	
		1.8 MHz	Tune to 1.8 MHz	SW1 ant coil L303 SW1 rf coil L307	
		4.2 MHz	Tune to 4.2 MHz	SW1 ant trimmer CT301-1 SW1 rf trimmer CT304	

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
SW2-SW10 1st IF Frequency Coverage	To the base of Q301 through a capacitor 0.01 - 0.04 μ F See Fig. 3-7 and Fig. 3-8.	1.55 MHz	Fully left	SW2-SW10, 2nd osc coil L310	Band Selector SW2 Adjust for maximum meter reading.
		2.25 MHz	Fully left	SW2-SW10, 2nd osc trimmer CT307	
SW2-SW10 1st IF Tracking		1.6 MHz	Tune to 1.6 MHz signal	SW2-SW10, 1st IF coil L302, L306	
		2.2 MHz	Tune to 2.2 MHz	SW2-SW10, 1st IF trimmer CT302, CT303	
SW2 Frequency Coverage	To the SW2- SW10 ext. ant. termi- nal through a dummy ant. See Fig. 3-9, and Fig. 3-10.	4.65 MHz	Fully left	SW2 1st osc coil L207	Band Selector SW2 DX-LOCAL Switch. DX Unsolder a violet lead shown in Fig. 3-10. Adjust for maximum meter reading.
		4.8 MHz	Tune to 4.8 MHz signal	SW2-SW4 ant coil L201 rf coil L204	
SW2 Tracking		5.2 MHz	Tune to 5.2 MHz signal	SW2 ant trimmer CT201 SW2 rf trimmer CT210	
SW3 Frequency Coverage	- ditto -	5.75 MHz	Fully left	SW3 1st osc coil L208	Band Selector SW3 DX-LOCAL Switch. DX Adjust for maximum meter reading.
SW3 Tracking		6.3 MHz	Tune to 6.3 MHz	SW3 ant trimmer CT202 SW3 rf trimmer CT211	
SW4 Frequency Coverage	ditto -	6.95 MHz	Fully left	SW4 1st osc coil L209	Band Selector SW4 DX-LOCAL Switch. DX Adjust for maximum meter reading.
SW4 Tracking		7.5 MHz	Tune to 7.5 MHz	SW4 ant trimmer CT203 SW4 rf trimmer CT212	
SW5 Frequency Coverage	- ditto -	9.45 MHz	Fully left	SW5 1st osc coil L210	Band Selector SW5 DX-LOCAL Switch. DX Adjust for maximum meter reading.
		9.6 MHz	Tune to 9.6 MHz signal	SW5-SW7 ant coil L202 rf coil L205	
SW5 Tracking		10.0 MHz	Tune to 10.0 MHz signal	SW5 ant trimmer CT204 SW5 rf trimmer CT213	
SW6 Frequency Coverage	- ditto -	11.55 MHz	Fully left	SW6 1st osc coil L211	Band Selector SW6 DX-LOCAL Switch. DX Adjust for maximum meter reading.
SW6 Tracking		12.1 MHz	Tune to 12.1 MHz signal	SW6 ant trimmer CT205 SW6 rf trimmer CT214	

Adjustment	Rf Signal Generator Coupling	Rf Signal Generator Frequency	Receiver Dial Setting	Adjust	Remarks
SW7 Frequency Coverage	ditto -	14.95 MHz	Fully left	SW7 1st osc coil L212	Band Selector SW7 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW7 Tracking		15.5 MHz	Tune to 15.5 MHz signal	SW7 ant trimmer CT206 SW7 rf trimmer CT215	
SW8 Frequency Coverage	ditto	17.45 MHz	Fully left	SW8 1st osc coil L213	Band Selector: SW8 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW8 Tracking		17.6 MHz	Tune to 17.6 MHz signal	SW8 - SW10 ant coil L203 rf coil L206	
		18.0 MHz	Tune to 18.0 MHz signal	SW8 ant trimmer CT207 SW8 rf trimmer CT216	
SW9 Frequency Coverage	- ditto -	21.35 MHz	Fully left	SW9 1st osc coil L214	Band Selector SW9 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW9 Tracking		21.9 MHz	Tune to 21.9 MHz	SW9 ant trimmer CT208 SW9 rf trimmer CT217	
SW10 Frequency Coverage	ditto -	25.45 MHz	Fully left	SW10 1st osc coil L215	Band Selector SW10 DX-LOCAL Switch: DX Adjust for maximum meter reading.
SW10 Tracking		26.0 MHz	Tune to 26.0 MHz	SW10 ant trimmer CT209 SW10 rf trimmer CT218	

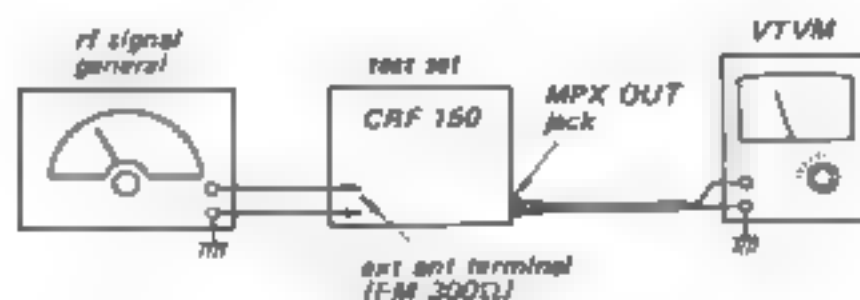


Fig. 3-4 Fm frequency coverage and tracking adjustment setup

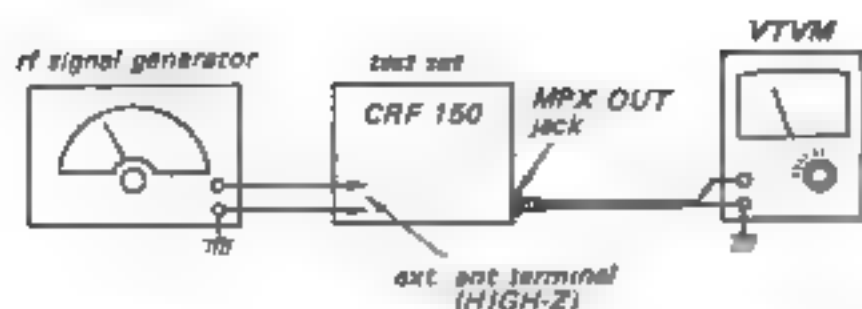


Fig. 3-5 SW1 frequency coverage and tracking adjustment setup

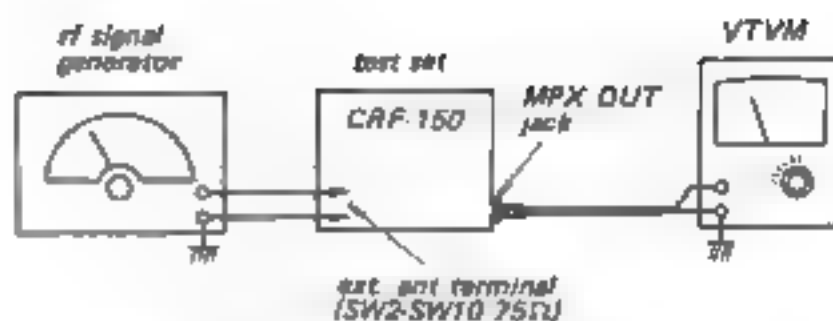


Fig. 3-9 SW2-SW10 frequency coverage and tracking adjustment setup

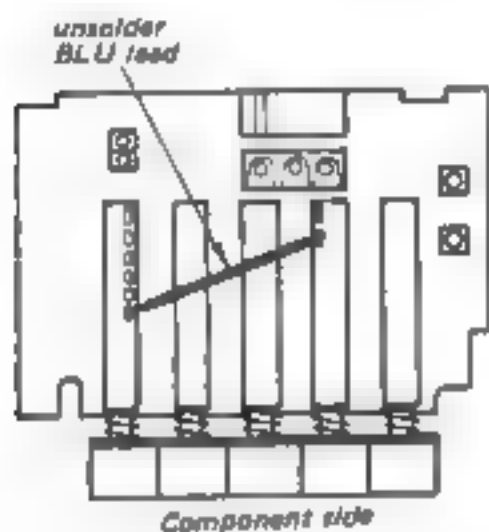


Fig. 3-6 Blue lead on cp circuit board

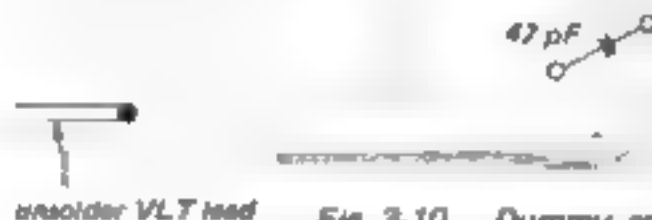


Fig. 3-10 Dummy antenna 47 pF on sw tuner front end

3-3. ADJUSTING PARTS LOCATIONS

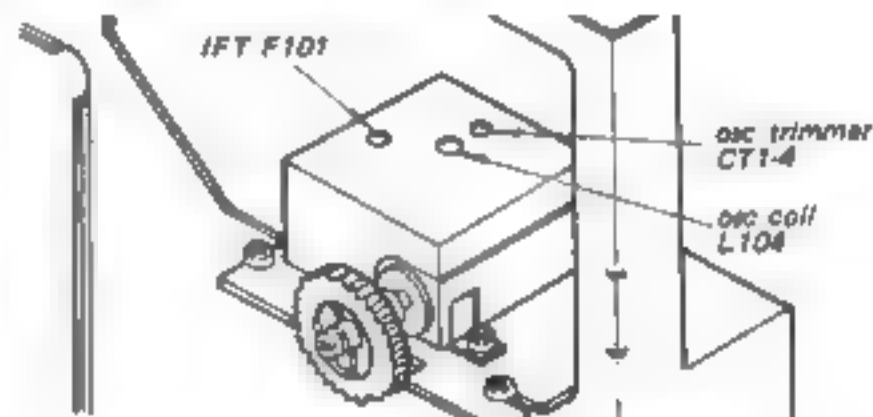


Fig. 3-11 Fm tuner block adjustments on fm tuner block

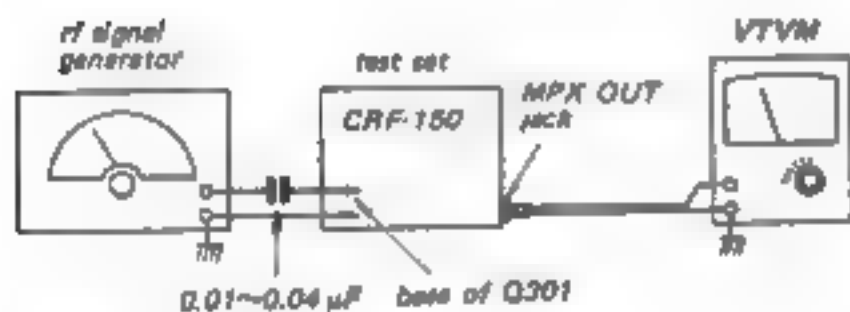


Fig. 3-7 SW2-SW10 1st i-f frequency coverage and tracking adjustment setup



Fig. 3-8 Signal generator connection

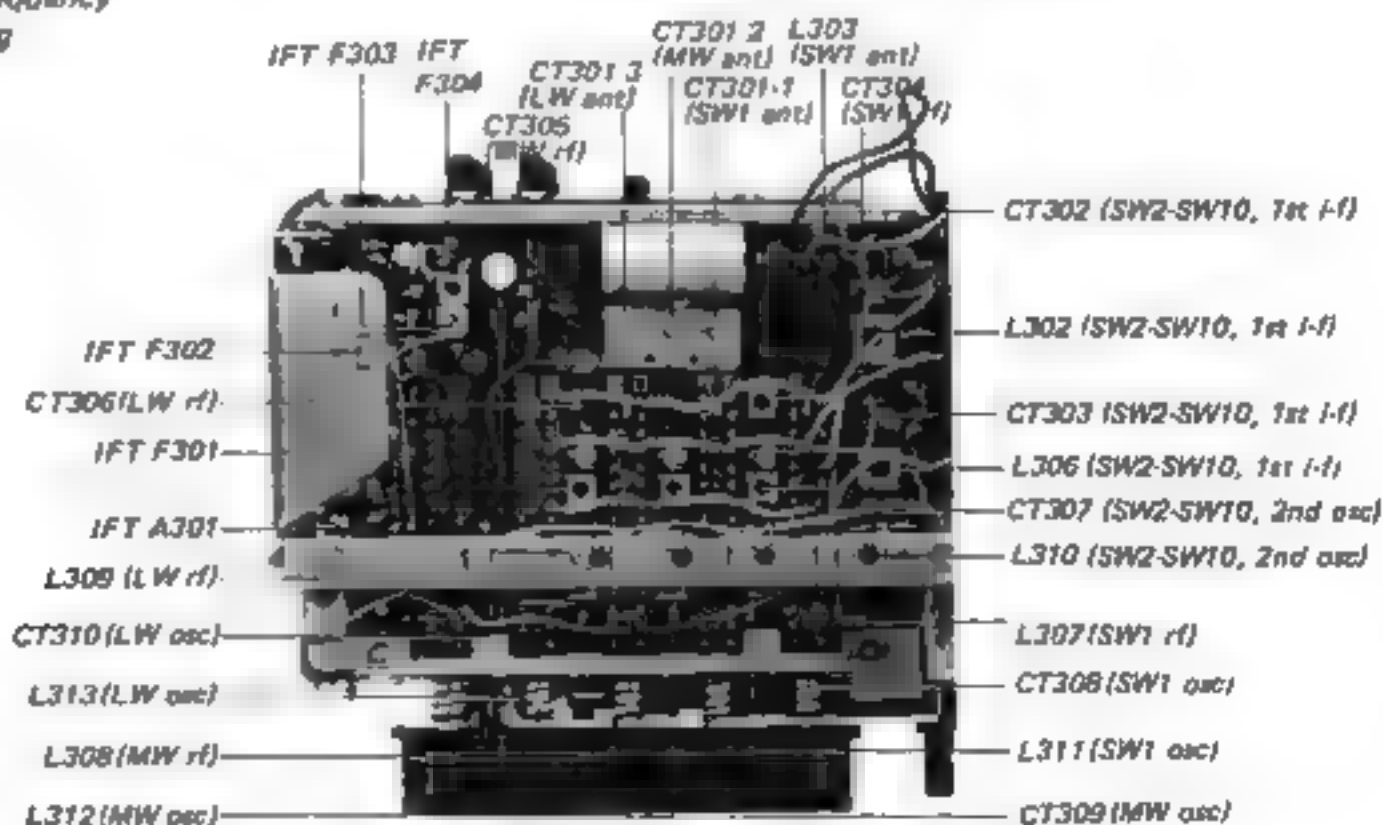


Fig. 3-12 Cp/i-f circuit board adjustments

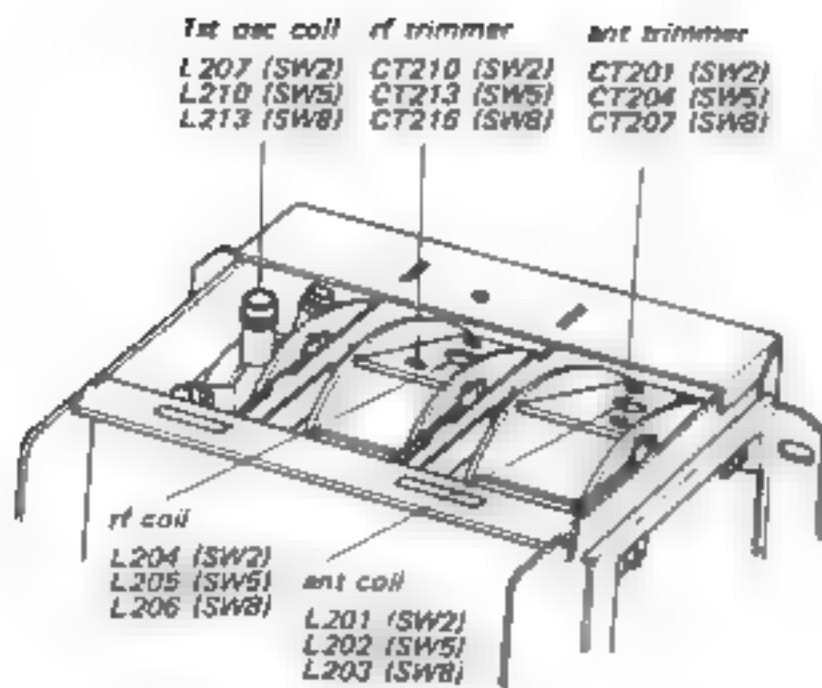


Fig. 3-13 Adjusting parts for SW2, SW6, SW8

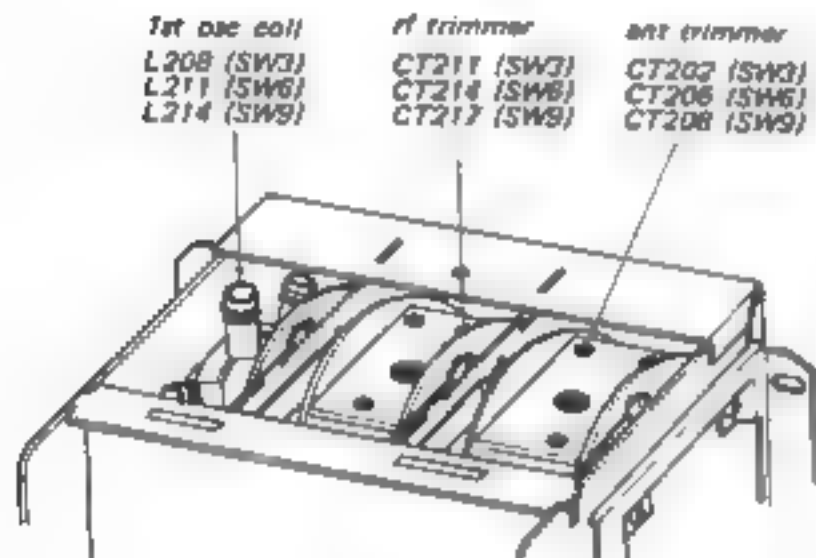


Fig. 3-14 Adjusting parts for SW3, SW6, SW9

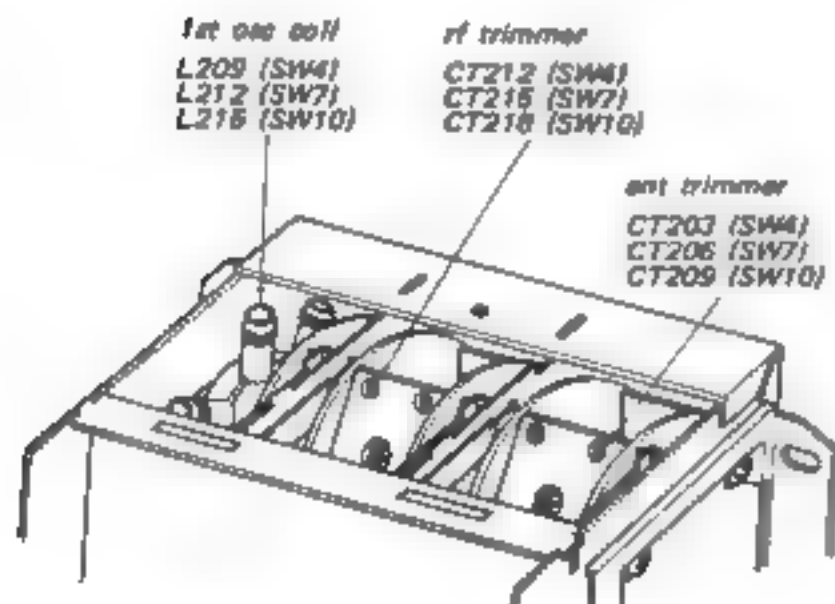


Fig. 3-15 Adjusting parts for SW4, SW7, SW10

3-4. VOLTAGE AND CURRENT ADJUSTMENT

1. Regulator Voltage

Parts to be selected: R369

Band selector: MW

Power requirement: ac

Adjustment: R369 must be selected to obtain 4.5V at emitter of Q309

R369: $\frac{1}{4}$ W carbon resistor,
 1-244-670- 750 Ω
 1-244-671- 820 Ω
 1-244-672- 910 Ω
 1-244-673- 1 k Ω
 1-244-674- 1,100 Ω
 1-244-675- 1,200 Ω

2. A-m I-f Current

Parts to be selected: R338

Band selector: MW

Power requirement: ac

Adjustment: R338 must be selected to obtain 0.27V at emitter of Q306

R338: $\frac{1}{4}$ W carbon resistor,
 1-244-720- 91 k Ω
 1-244-721- 100 k Ω
 1-244-722- 110 k Ω
 1-244-723- 120 k Ω
 1-244-724- 130 k Ω
 1-244-725- 150 k Ω
 1-244-726- 160 k Ω

3. Fm I-f Current

Parts to be selected: R343

Band selector: FM

Power requirement: ac

Adjustment: R343 must be selected to obtain 0.31V at emitter of Q306.

R343: $\frac{1}{4}$ W carbon resistor,
 1-244-672- 910 Ω
 1-244-673- 1 k Ω
 1-244-674- 1,100 Ω
 1-244-675- 1,200 Ω
 1-244-676- 1,300 Ω
 1-244-677- 1,500 Ω

4. Sw Agc Bias

Parts to be adjusted: R212 (100 k Ω adjustable)

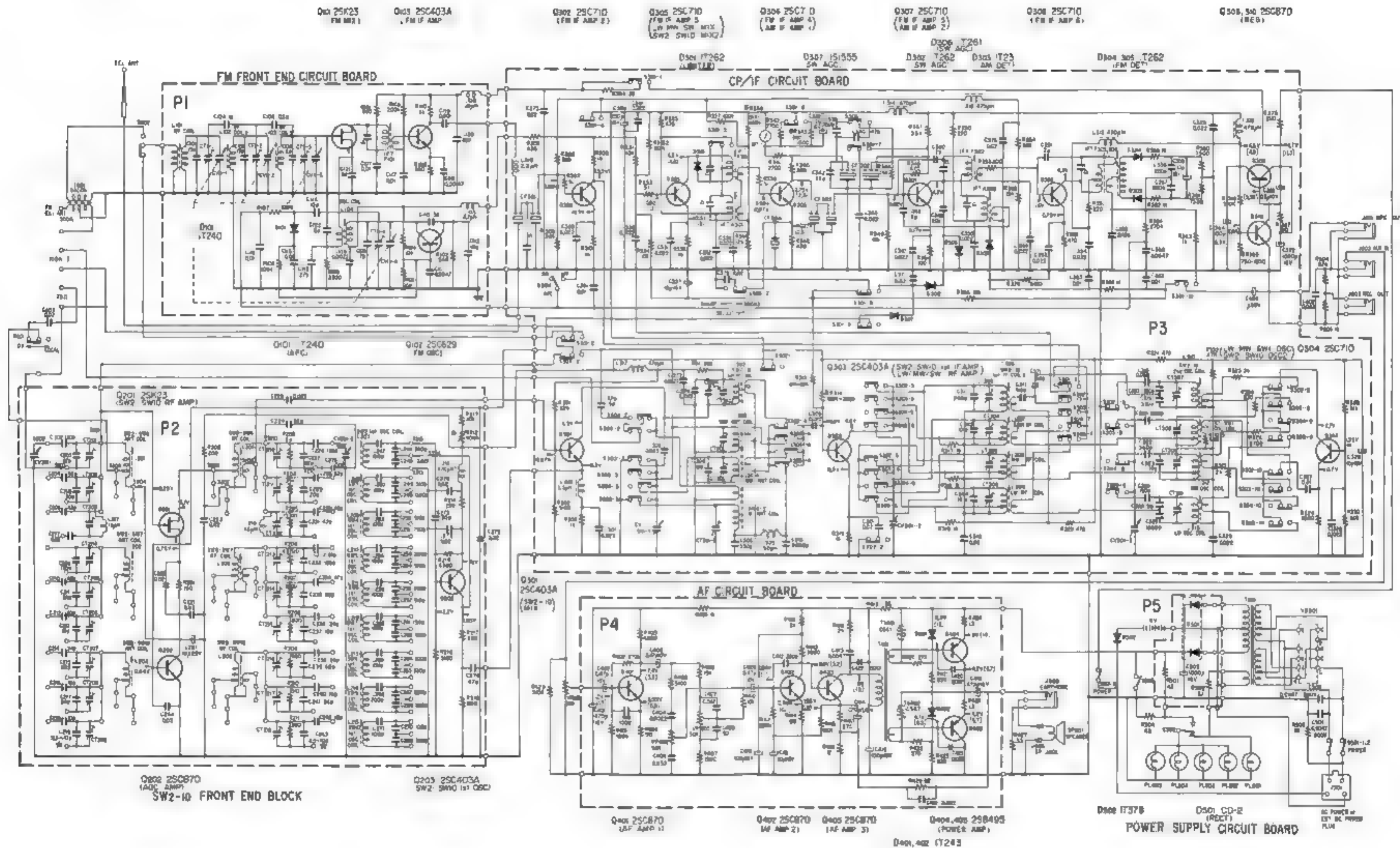
Band selector: SW2 SW10

Power requirement: ac or dc

Adjustment: R212 must be adjusted to obtain 0.5V across resistor R201.

SECTION 4
SCHEMATIC AND MOUNTING DIAGRAMS

4-1. SCHEMATIC DIAGRAM



Notes:

1. ch shows grounding to the chassis.
2. All resistors and capacitors are in Ω and μF , unless otherwise indicated.
3. Capacitors marked Δ are built in I-f transformers.
4. Capacitors marked \star are added for the unit that the best tracking point is out of the adjustable range.
5. The symbol \oplus indicates a component whose value is selected to yield normal operating condition.
6. Voltage values are measured from point indicated to ground circuit with a dc voltmeter (20k Ω /V) and current values are measured with a dc ammeter. Voltage and current values are taken with no radio signal received.
7. The values shown in { } are taken with fm reception and in [] with ac power input.
8. Variations may be noted due to normal production tolerances.











Switch Functions

Ref. No.	Description	Mode
S201-215	Band Selector, SW2-SW10	SW2
S301	Band Selector, FM	OFF
S302	Band Selector, SW2-SW10	OFF
S303	Band Selector, SW1	OFF
S304	Band Selector, MW	ON
S305	Band Selector, LW	OFF
S306	SELECTIVITY BROAD-SHARP	BROAD
S501	Power ON-OFF	ON
S502	Pilot Lamp	ON
S503	EXT DC Power	OFF
S504	AFC ON-OFF	ON
S601	SENSITIVITY DX-LOCAL	DX

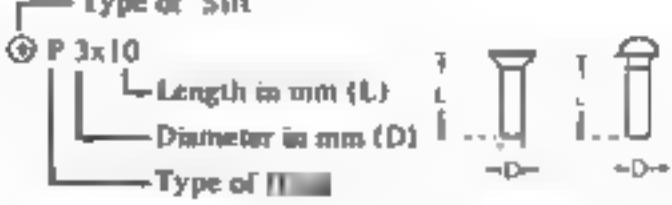
S301-S305		
S306		
S601		

When ordering replacement parts, you should use PART NUMBER listed on the Complete Spare Parts List attached herewith. The symbol number should not be used for ordering purposes.

Hardware Nomenclature

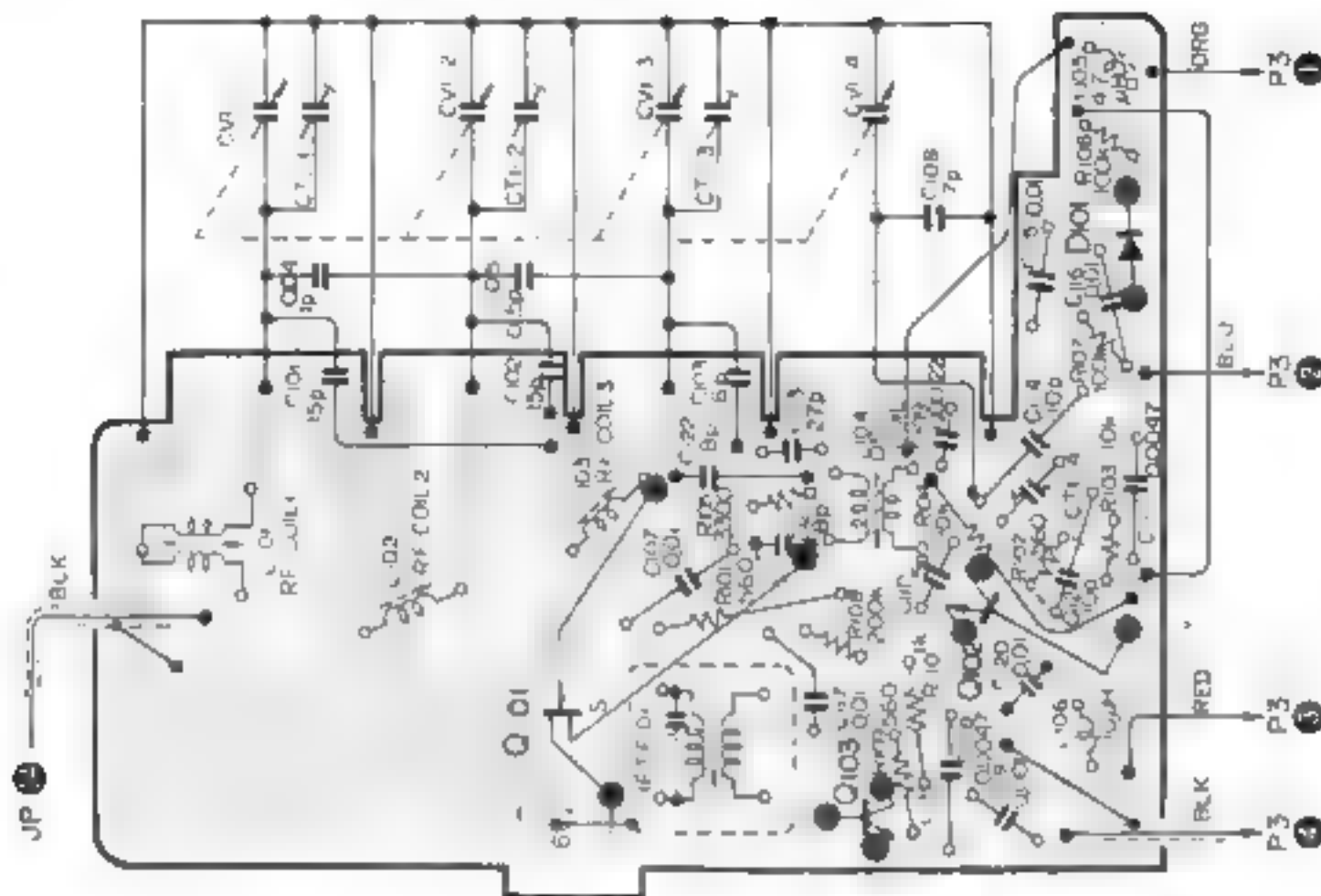
P - Pan Head Screw .. 	SC - Set Screw 
PS - Pan Head Screw with Spring Washer 	E - Retaining Ring (E Washer) 
K - Flat Countersunk Head Screw 	W - Washer
B - Binding Head Screw .. 	SW - Spring Washer
RK - Oval Countersunk Head Screw .. 	LW - Lock Washer
T - Truss Head Screw 	N - Nut
R - Round Head Screw .. 	
F - Flat Elliptical Head Screw 	

- Example -



4-2. FM TUNER CIRCUIT BOARD (P1)

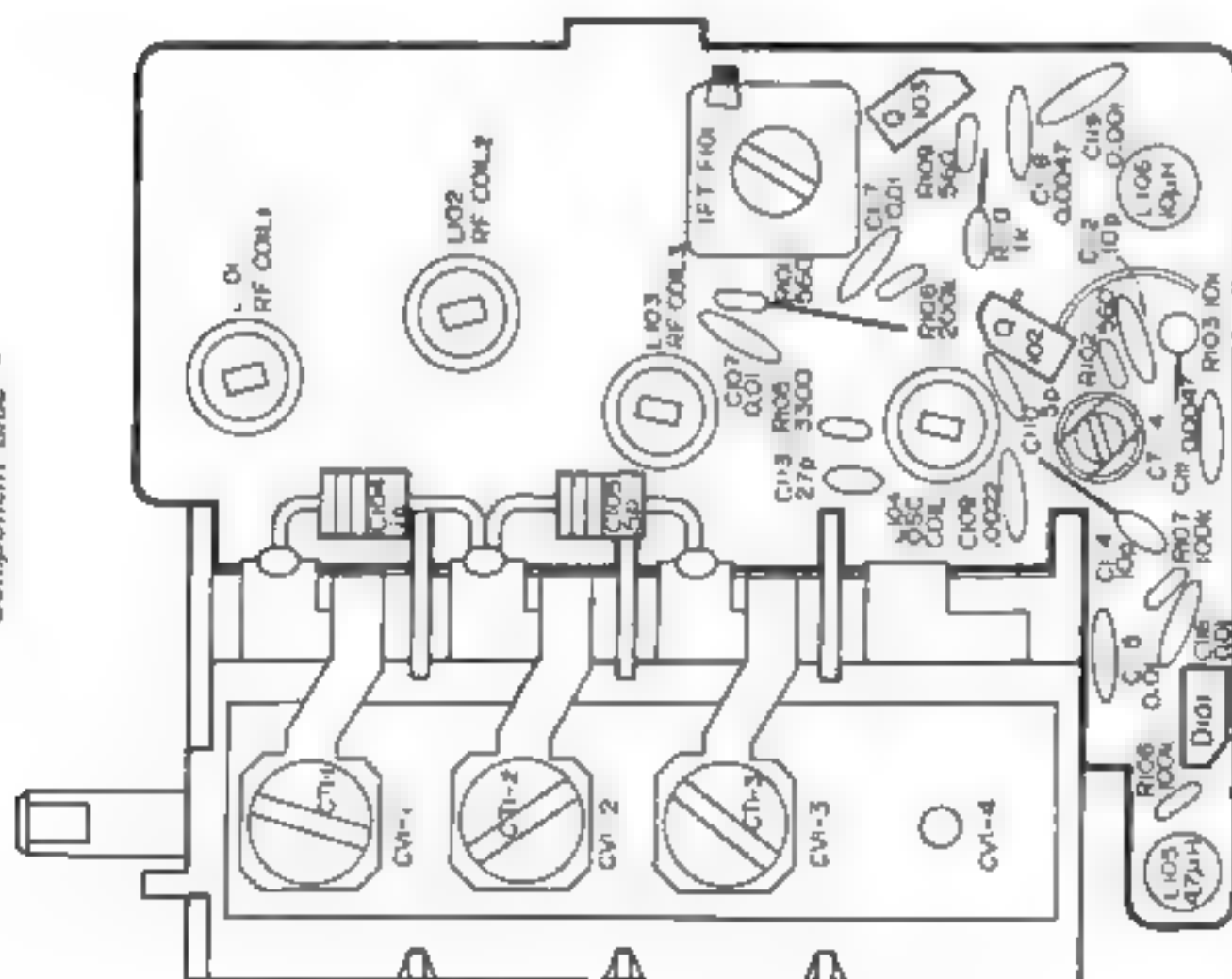
Conductor Side



Note 1 The following parts are mounted on the conductor side: C101, C102, C103, C108, C120, C121, C122, R104 and Q103

2. Printed circuit board: Part No. 1-538-793-12

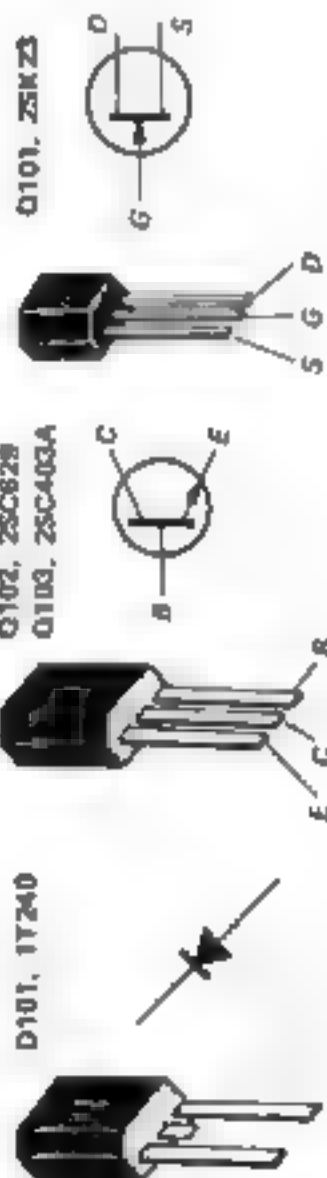
Component Side



D101, 1Y240

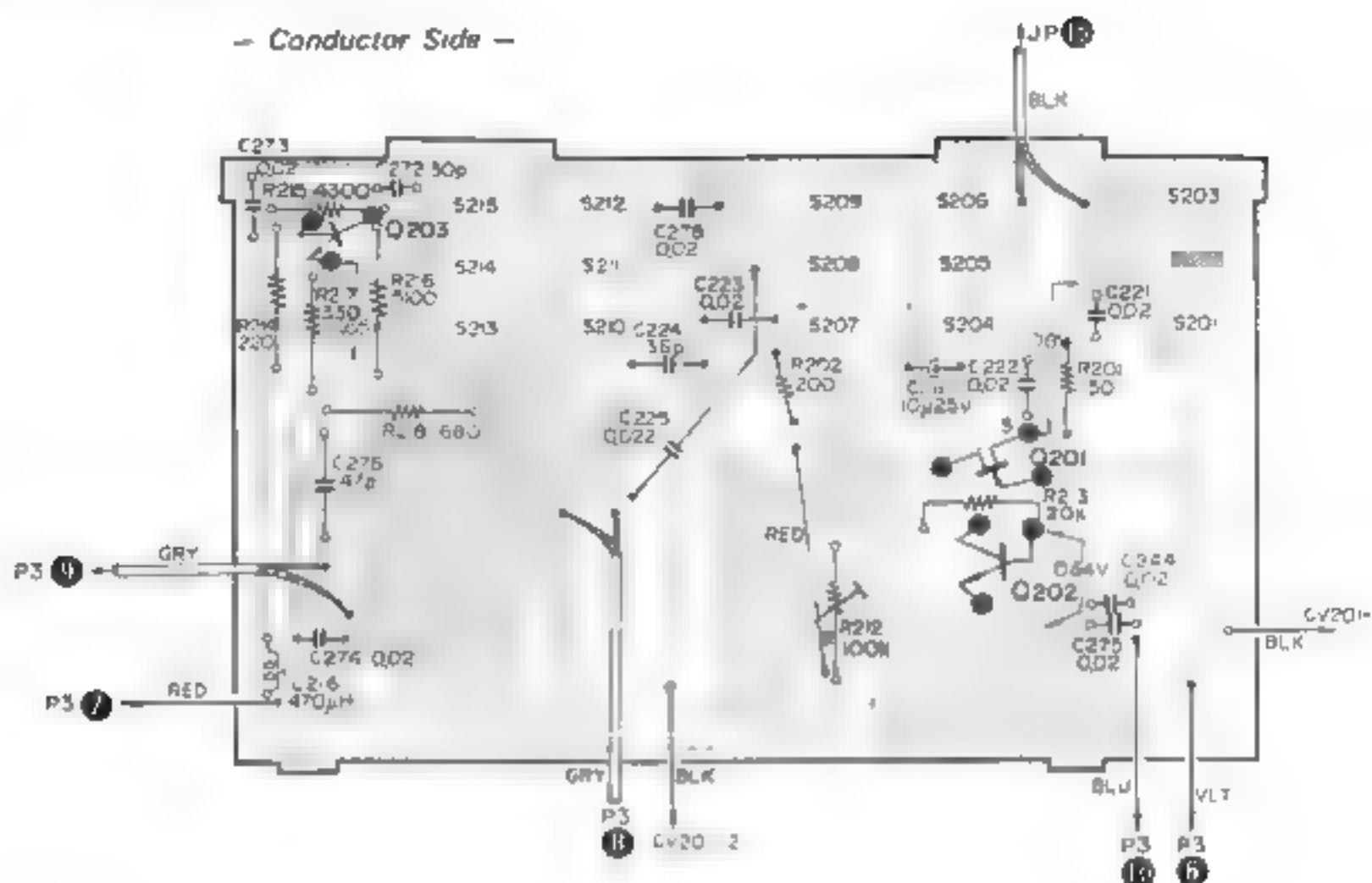
Q102, 2SC828
Q103, 2SC403A

Q101, 2SK23



4-3. SW2-SW10 FRONT END (p2)

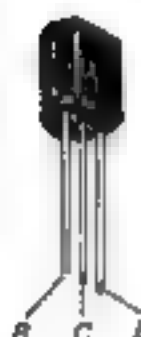
- Conductor Side -



- Component Side -



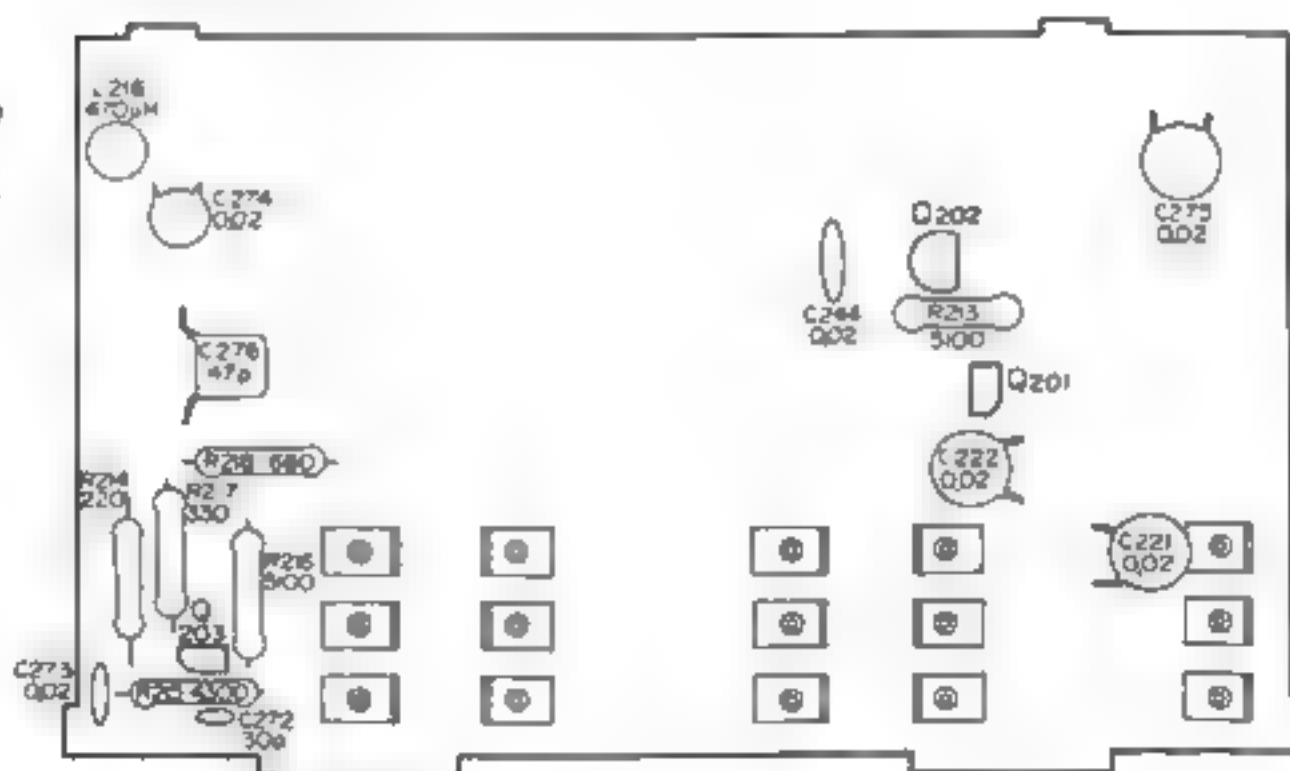
Q201, 25K23



Q202: ZSC870

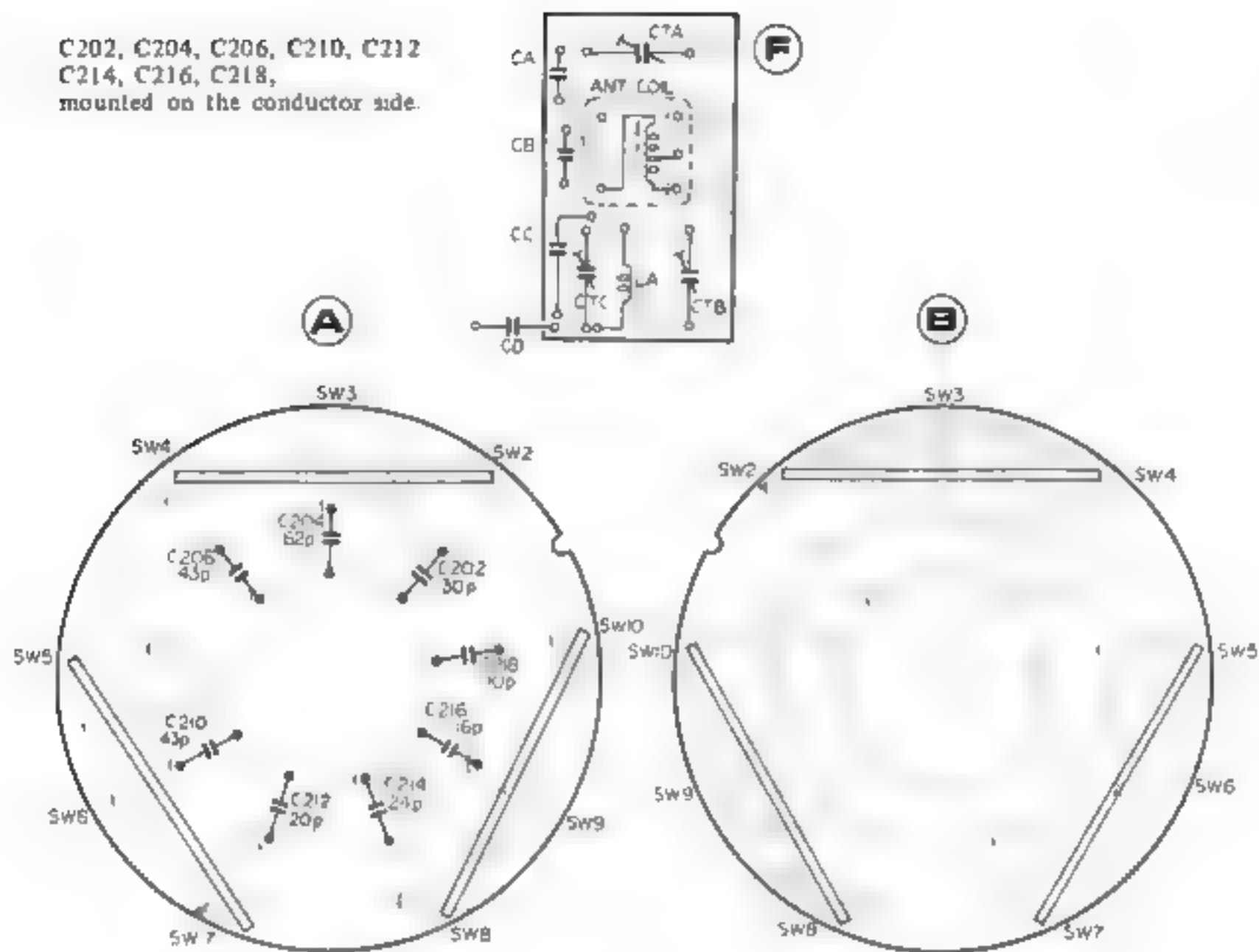


Q203: Z5C403A

**Note**

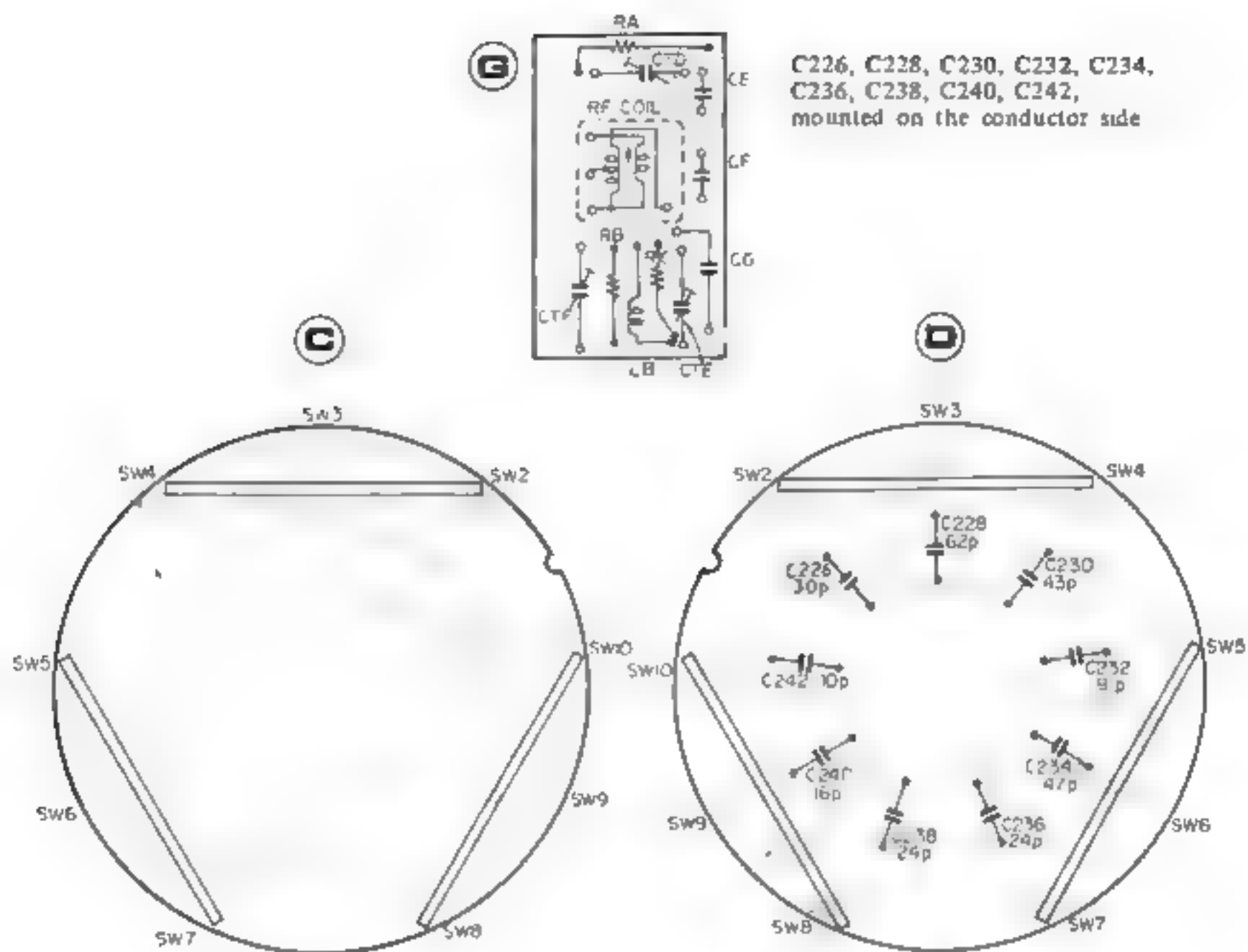
1. The following parts are mounted on the conductor side; R201, R202, C223, C224, C225, C278, C281, Q201, Q202, Q203 and R212.
2. Printed circuit board;
Part No. 1-539-244-11

C202, C204, C206, C210, C212
C214, C216, C218,
mounted on the conductor side.



Parts Description on Circuit Board (F)

BAND	ANT COIL	CAPACITOR			TRIMMER CAPACITOR			CO LA	
		CA	CB	CC	CTA	CTB	CTC		
SW2~ SW4	L201	C203	C205		CT201	CT202	CT203	C277	L217
		62pF	20pF					0.02μH	18μH
SW5~ SW7	L202	C209	C211	C213	CT204	CT205	CT206		
		130 pF	56 pF	10 pF					
SW8~ SW10	L203	C215	C217	C219	CT207	CT208	CT209		
		68 pF	24 pF	0.5 ~10 pF					

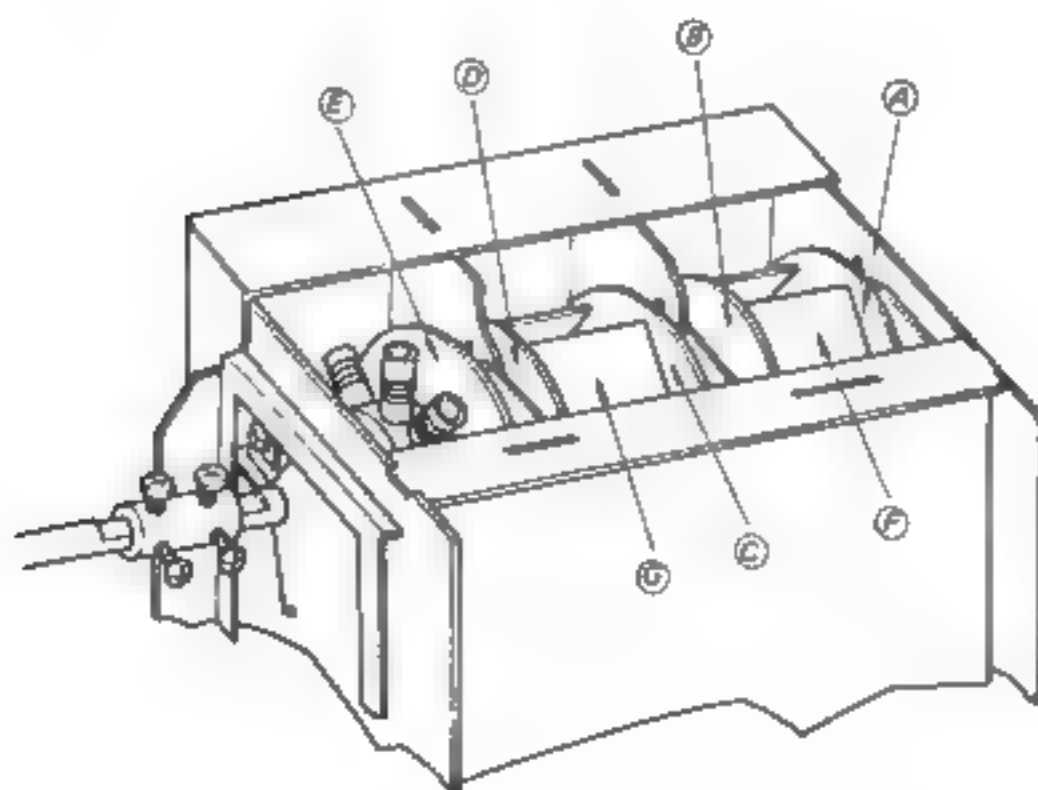
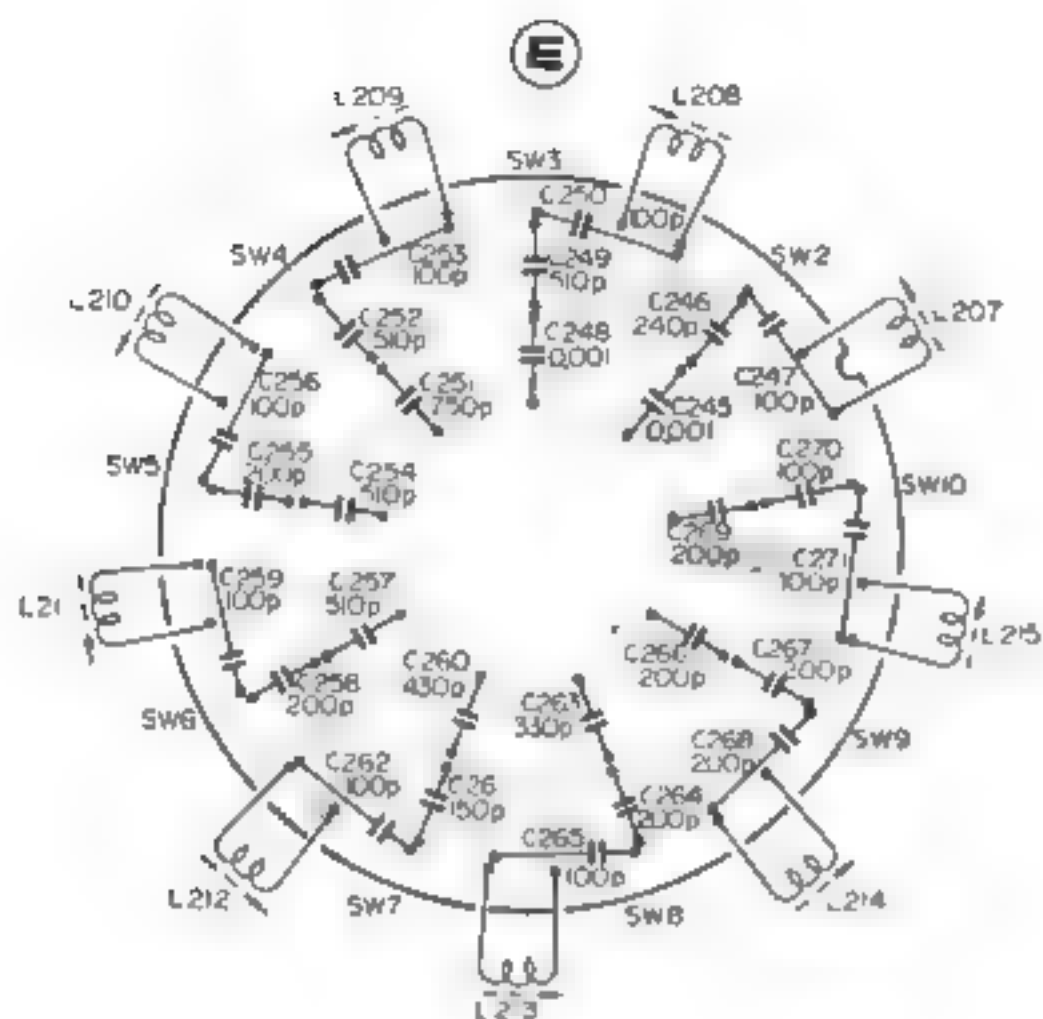


Parts Description on Circuit Board **E**

BAND	RF COIL	CAPACITOR			RESISTOR			TRIMMER CAPACITOR			LB
		CE	CF	CG	RA	RB	RC	CTD	CTE	CTF	
SW2-SW4	L204	C227 62pF	C229 20pF	C231 47pF	R203 3k	R204 2k	R205 1,500	CT 210	CT 211	CT 212	L218 18μH
SW5-SW7	L206	C233 120pF	C236 62pF	C237 10pF	R206 4,300	R207 1,800	R208 820	CT 213	CT 214	CT 215	
SW8-SW10	L206	C239 88pF	C241 24pF	C243 0.5-10pF	R209 680	R210 510	R211 390	CT 216	CT 217	CT 218	

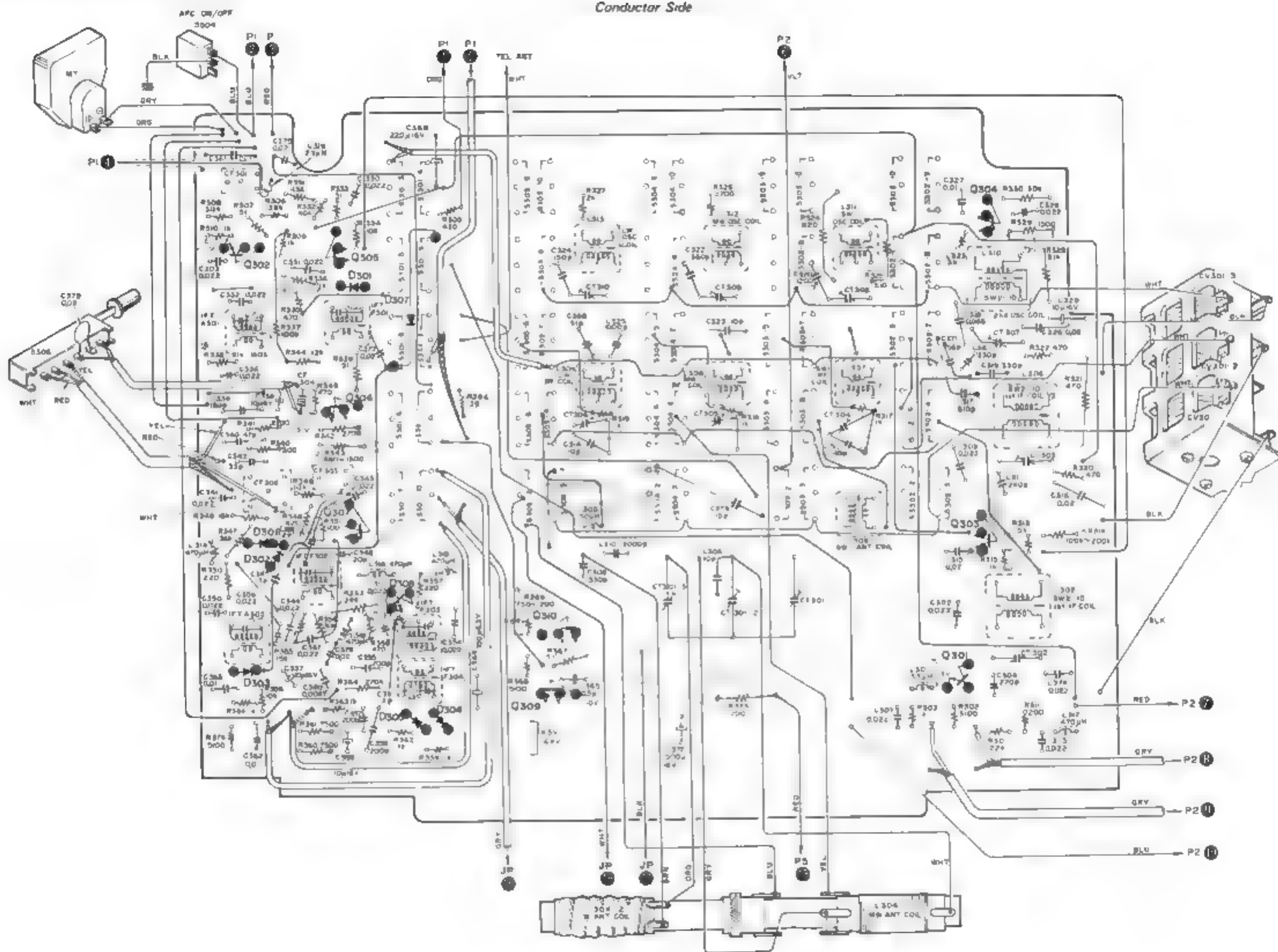
RA, RB, RC, LB, mounted on the conductor side.

C245-C271, L207-L215,
mounted on the conductor side.

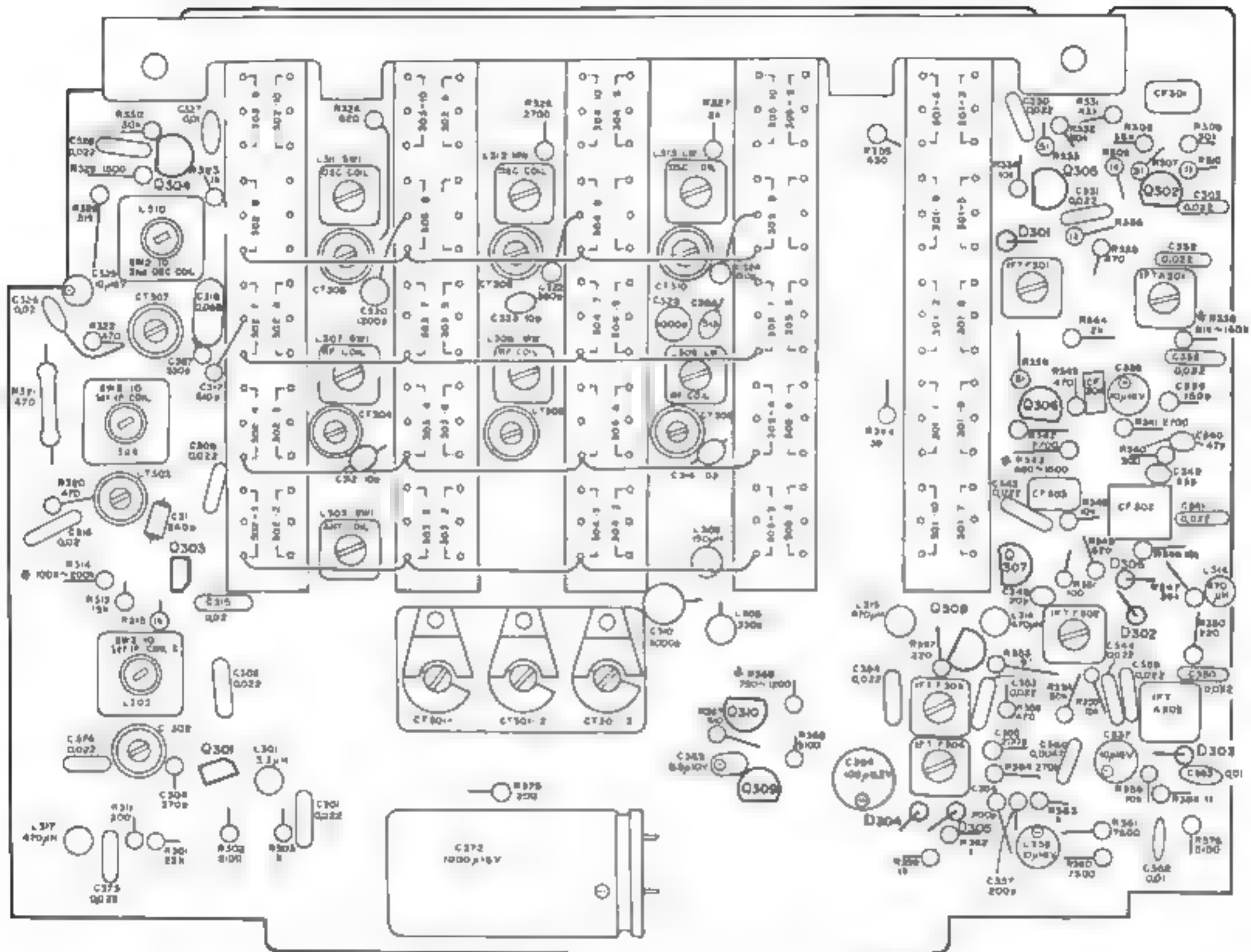


4-4. CP/IF CIRCUIT BOARD (P3)

Conductor Side



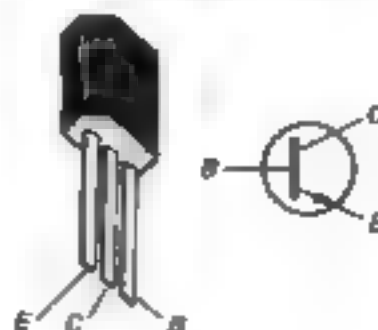
- Component Side -



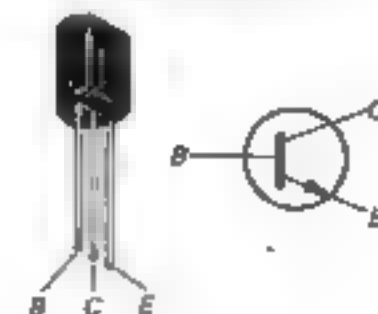
Note:

1. The following parts are mounted on the conductor side
R317, R318, R319, R325, R337, C306, C319, C345,
C347, C361, C369, C371, C376, C377, C379, L318, D307
2. Printed circuit board. Part No. 1-539-252-12

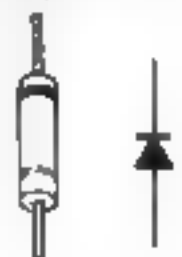
Q301, Q303: 2SC403A



Q302, Q304 - Q308: 2SC710
Q309, Q310: 2SC870

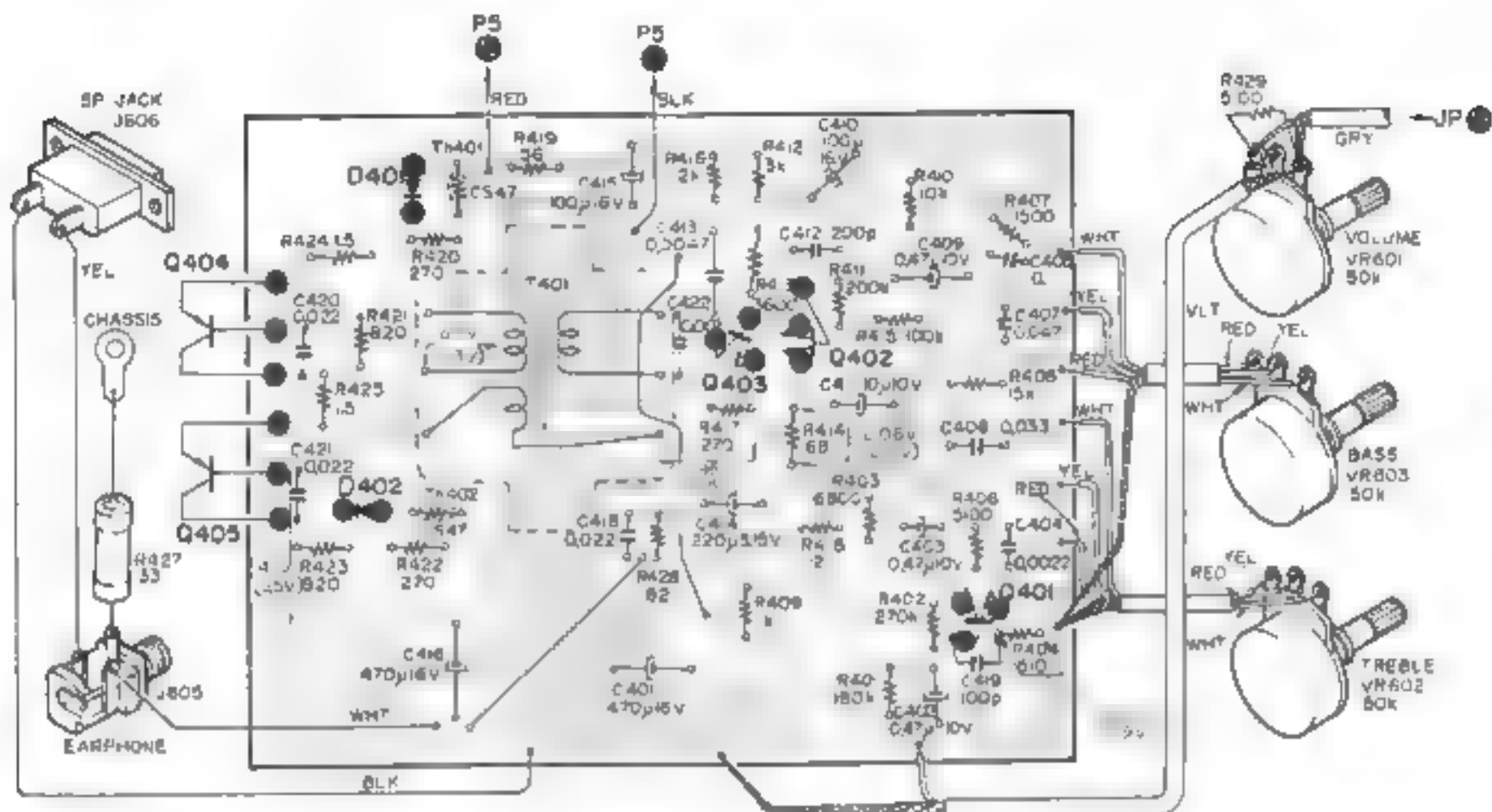


D301, D302, D304,
D305, 1T262
D303, 1T23
D306, 1T281

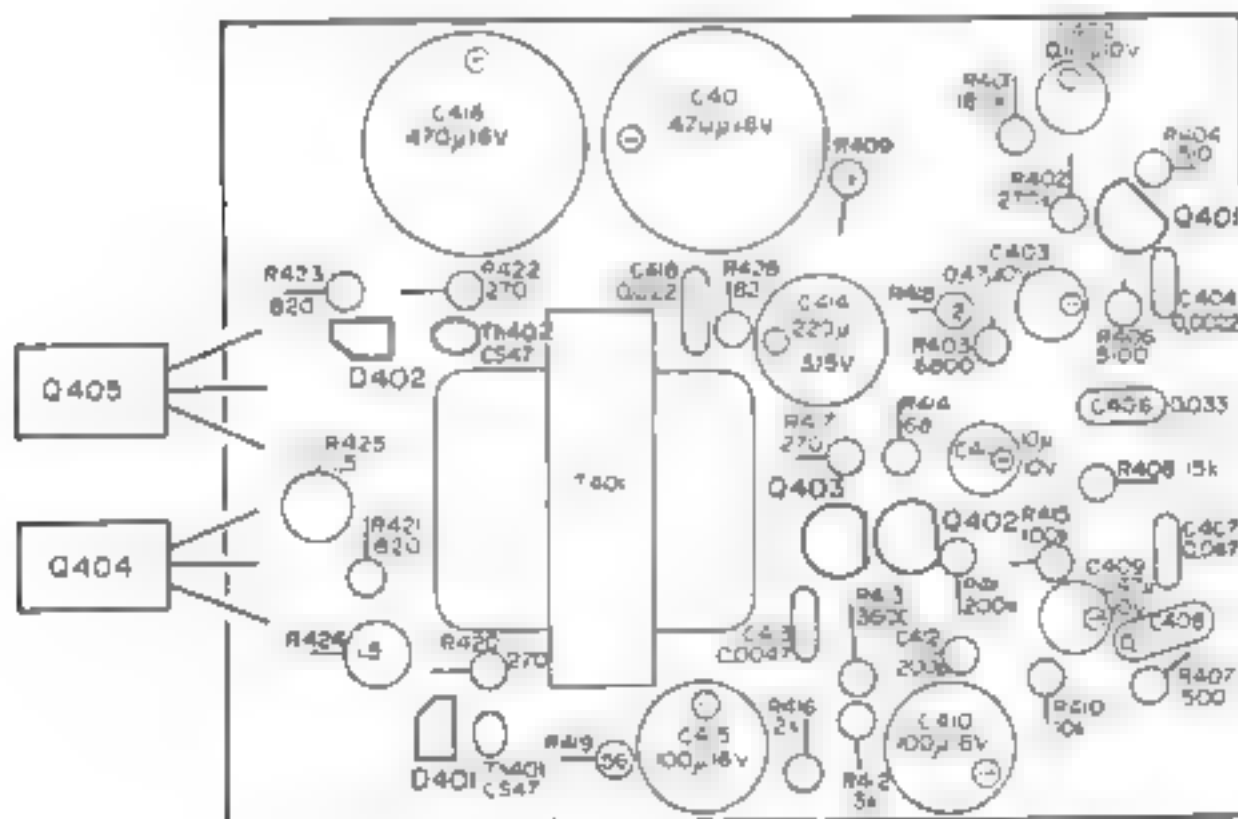


4.5. AF CIRCUIT BOARD

— Conductor Side —



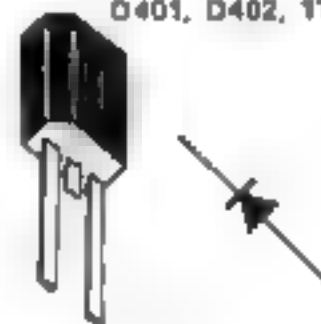
— Component Side —



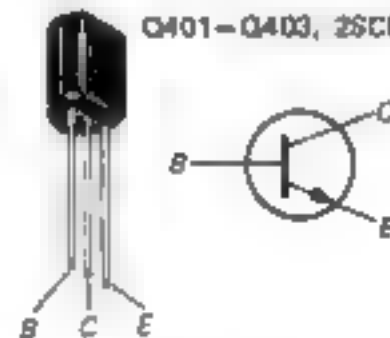
Note:

1. The following parts are mounted on the conductor side; C419, C420, C421, C422.
2. Printed circuit board, Part No. 1-539-253-11

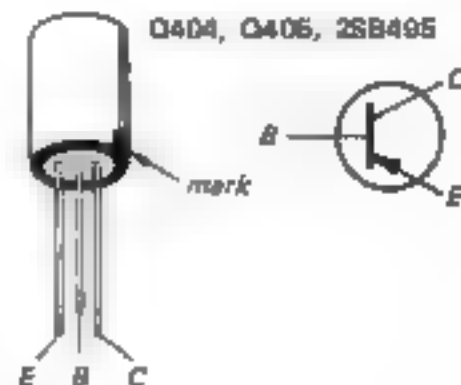
D401, D402, 1T243



Q401-Q403, 2SC870

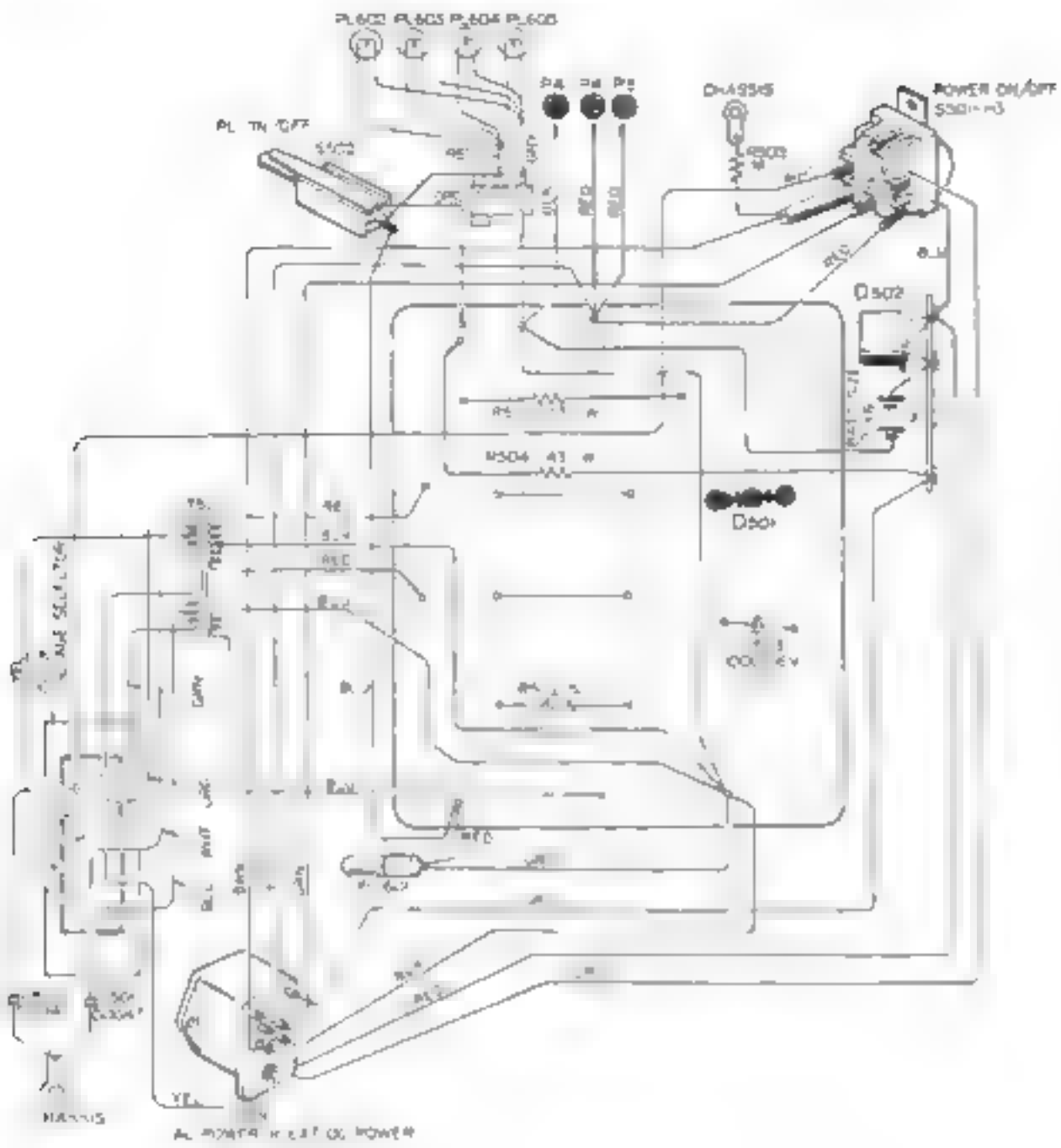


Q404, Q405, 2SB495

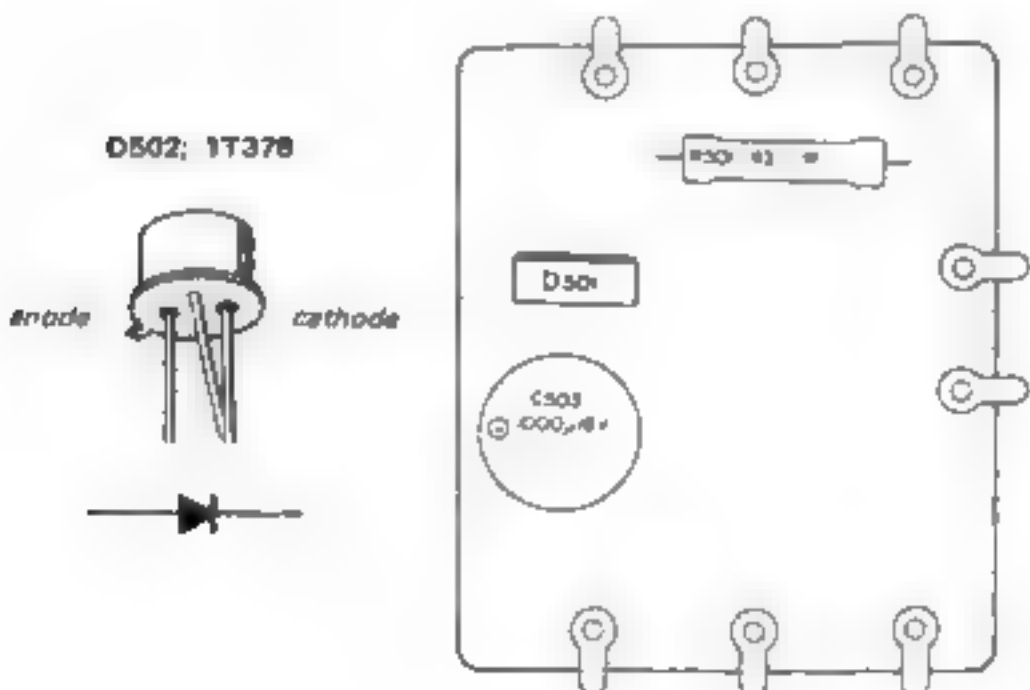


4-6. POWER SUPPLY CIRCUIT BOARD

- Conductor Side -



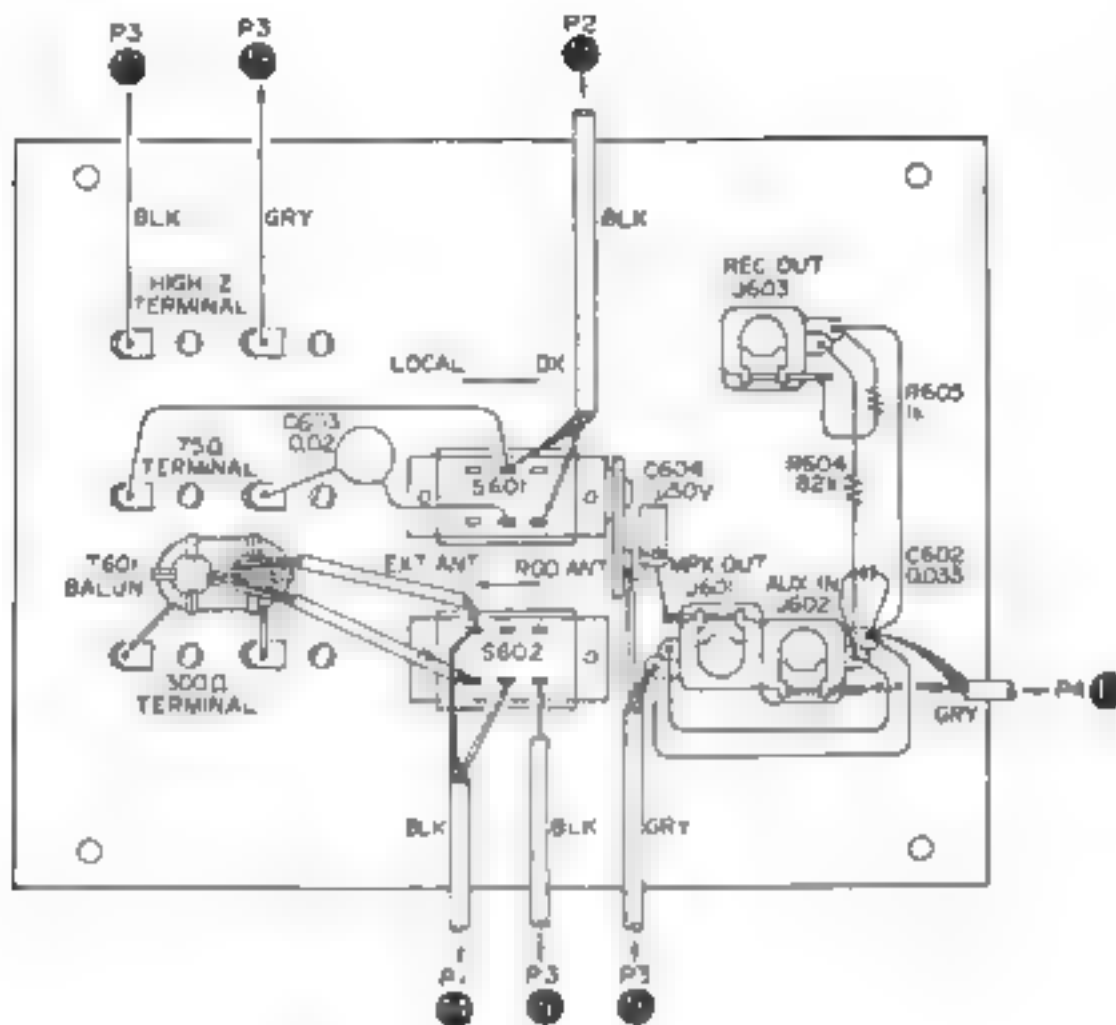
- Component Side -



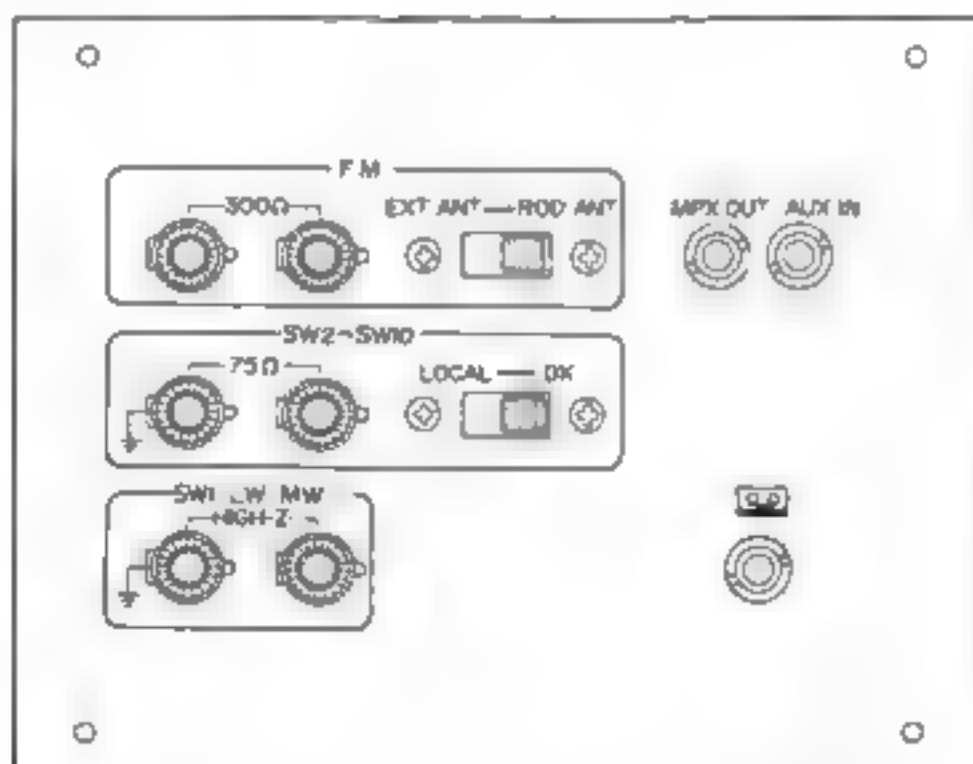
Printed circuit board
Part No. 1-539-254-11

4-7. JACK PANEL

— Conductor Side —

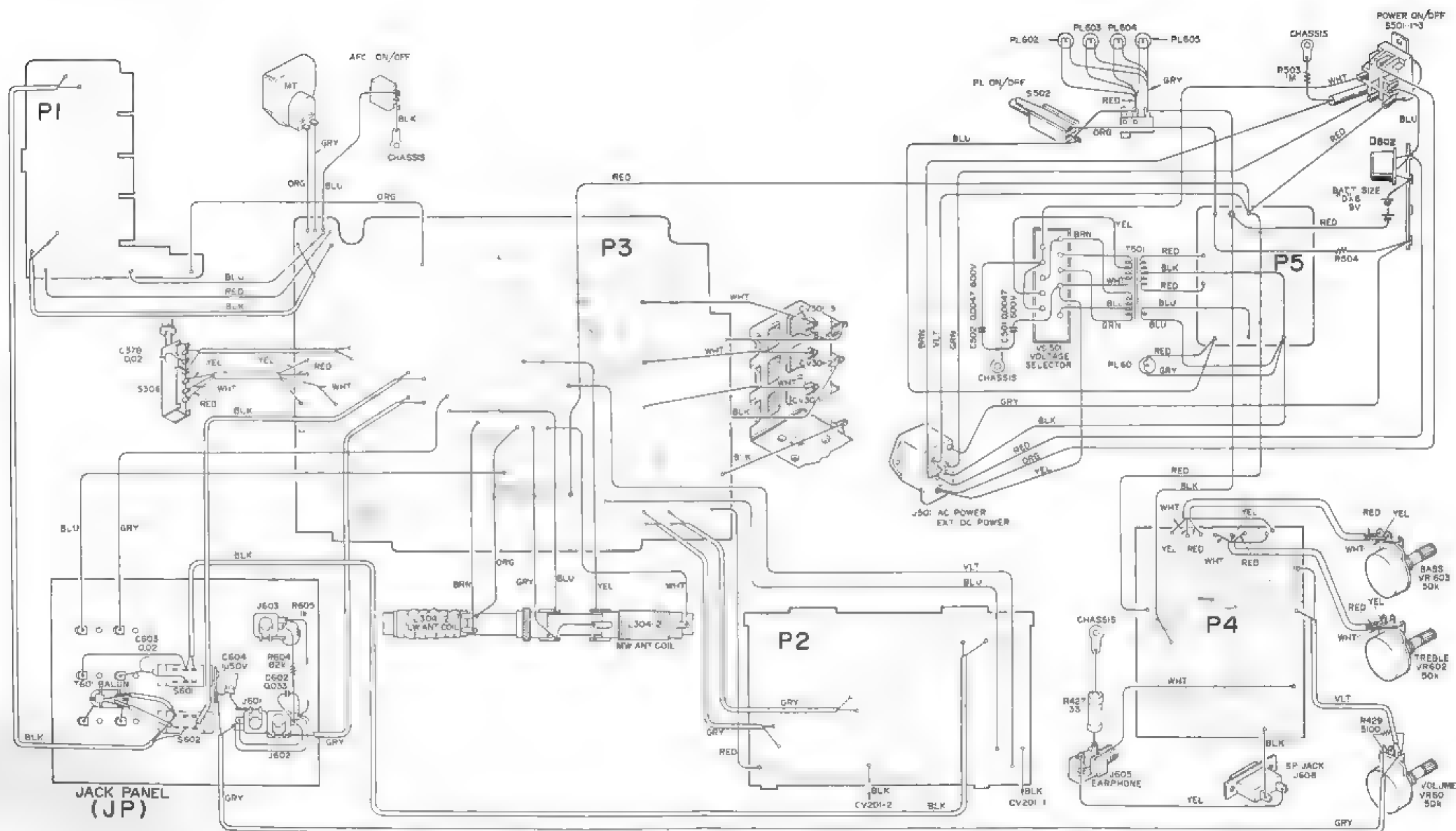


— Component Side —



MEMO

4-B. WIRING DIAGRAM



SECTION 5

ELECTRICAL PARTS LIST

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
SEMICONDUCTORS					
Q101		transistor (FET) 2SK23	L212	1-405-424-	1st osc coil, SW7
Q102		transistor 2SC629	L213	1-405-425-	1st osc coil, SW8
Q103		transistor 2SC403A	L214	1-405-426-	1st osc coil, SW9
Q201		transistor (FET) 2SK23	L215	1-405-427-	1st osc coil, SW10
Q202		transistor 2SC870	L216	1-407-177-	micro inductor 470 μ H
Q203		transistor 2SC403A	L217	1-407-160-	micro inductor 18 μ H
Q301		transistor 2SC403A	L218	1-407-160-	micro inductor 18 μ H
Q302	1-801-003-	transistor 2SC710	L301	1-407-184-	micro inductor 3.3 μ H
Q303		transistor 2SC403A	L302	1-425-442-	coil, SW2 SW10 1st LF
Q304	1-801-003-	transistor 2SC710	L303	1-401-408-	antenna coil, SW1
Q305	1-801-003-	transistor 2SC710	L304	1-401-348-23	antenna coil, mw/tw ferrite bar
Q306	1-801-003-	transistor 2SC710	L305	1-407-171-	micro inductor 150 μ H
Q307	1-801-003-	transistor 2SC710	L306	1-425-442-	coil, SW2 SW10 1st LF
Q308	1-801-003-	transistor 2SC710	L307	1-425-577-	rf coil, SW1
Q309	1-801-004-	transistor 2SC870	L308	1-425-578-	rf coil, mw
Q301	1-801-004-	transistor 2SC870	L309	1-425-582-	rf coil, lw
Q401	1-801-004-	transistor 2SC870	L310	1-425-576-	2nd osc coil, SW2-SW10
Q402	1-801-004-	transistor 2SC870	L311	1-405-408-	osc coil, SW1
Q403	1-801-004-	transistor 2SC870	L312	1-405-409-	osc coil, mw
Q404	1-801-005-	transistor 2SB495	L313	1-405-410-	osc coil, lw
Q405	1-801-005-	transistor 2SB495	L314	1-407-177-	micro inductor, 470 μ H
D101		diode 1T240	L315	1-407-177-	micro inductor, 470 μ H
D301		diode 1T262	L316	1-407-177-	micro inductor, 470 μ H
D302		diode 1T262	L317	1-407-177-	micro inductor, 470 μ H
D303		diode 1T23	L318	1-407-177-	micro inductor, 470 μ H
D304		diode 1T262	L319	1-407-182-	micro inductor, 2.2 μ H
D305		diode 1T262	IFT F101	1-403-294-	transformer, fm rf
D306		diode 1T261	IFT F301	1-403-244-15	transformer, fm lf
D307		diode 1S1555	IFT F302	1-403-244-15	transformer, fm lf
D401		diode 1T243	IFT F303	1-403-272-15	discriminator, fm lf
D402		diode 1T243	IFT F304	1-403-288-11	discriminator, fm lf
D501		diode CD-2	IFT A301	1-403-026-211	transformer, a-m lf
D502		diode 1T378	IFT A302	1-403-137-11	transformer, a-m lf
Th401	1-691-002-01	thermistor CS-47	* CP301 * CP303	1-527-501-11	ceramic filter, fm 10.70 MHz (RED)
Th402	1-691-002-01	thermistor CS-47		1-527-501-12	ceramic filter, fm 10.67 MHz (BLU)
				1-527-501-13	ceramic filter, fm 10.73 MHz (ORG)
				1-527-501-14	ceramic filter, fm 10.64 MHz (BLK)
				1-527-501-15	ceramic filter, fm 10.76 MHz (WHT)
COILS AND TRANSFORMERS			CF302	1-403-161-13	ceramic filter, a-m
Ceramic filters marked \star are selected to yield specified operating condition. When replacing it, use a ceramic filter as same colored as the used one.			CF304	1-403-154-11	ceramic filter, a-m
L101	1-425-526-	rf coil, fm 1	T401	1-423-140-	transformer, input
L102	1-425-525-	rf coil, fm 2	T501	1-441-536-	transformer, power
L103	1-425-525-	rf coil, fm 3	T601	1-441-023-	balun
L104	1-425-386-	osc coil, fm	CAPACITORS		
L105	1-407-186-	micro inductor, 4.7 μ H	Capacitors marked \star are added for the unit that the best tracking point is out of the adjustable range.		
L106	1-407-190-	micro inductor, 10 μ H	C101	1-101-861-	15 pF ceramic
L201	1-401-405-	antenna coil, SW2 SW4	C102	1-101-861-	15 pF ceramic
L202	1-401-406-	antenna coil, SW5-SW7	C103	1-101-956-	6 pF ceramic
L203	1-401-407-	antenna coil, SW8 SW10	C104	1-101-937-	1 pF ceramic
L204	1-425-579-	rf coil, SW2-SW4	C105	1-101-936-	0.5 pF ceramic
L205	1-424-580-	rf coil, SW5-SW7	C106		- discarded -
L206	1-405-581-	rf coil, SW8-SW10	C107	1-101-864-	0.01 μ F ceramic
L207	1-405-419-	1st osc coil, SW2	C108	1-102-662-	7 pF ceramic
L208	1-405-420-	1st osc coil, SW3	C109	1-102-089-	0.0022 μ F ceramic
L209	1-405-421-	1st osc coil, SW4	C110	1-102-864-	5 pF ceramic
L210	1-405-422-	1st osc coil, SW5	C111	1-102-090-	0.0047 μ F ceramic
L211	1-405-423-	1st osc coil, SW6	C112	1-102-508-	10 pF ceramic

Ref. No.	Part No.	Description
C113	1-101-869-	27 pF ceramic
C114	1-101-976-	10 pF ceramic
C115	1-101-072-	0.01 μ F ceramic
C116	1-101-072-	0.01 μ F ceramic
C117	1-101-072-	0.01 μ F ceramic
C118	1-105-829-12	0.0047 μ F mylar
C119	1-101-918-	0.001 μ F ceramic
C120	1-101-072-	0.01 μ F ceramic
C121	1-101-958-	8 pF ceramic
C122	1-101-958-	8 pF ceramic
C201		- discarded -
C202	1-107-088-	130 pF silvered mica
C203	1-107-080-	62 pF silvered mica
C204	1-107-080-	62 pF silvered mica
C205	1-107-068-	20 pF silvered mica
C206	1-107-076-	43 pF silvered mica
C207		- discarded -
C208	1-107-084-	- discarded -
C209	1-107-088-	130 pF silvered mica
C210	1-107-076-	43 pF silvered mica
C211	1-107-079-	56 pF silvered mica
C212	1-107-068-	20 pF silvered mica
C213	1-107-061-	10 pF silvered mica
C214	1-107-070-	24 pF silvered mica
C215	1-107-081-	68 pF silvered mica
C216	1-107-066-	16 pF silvered mica
C217	1-107-070-	24 pF silvered mica
C218	1-107-061-	10 pF silvered mica
★ C219		0.5 pF - 10 pF silvered mica
C220		- discarded -
C221	1-101-924-	0.02 μ F ceramic
C222	1-101-924-	0.02 μ F ceramic
C223	1-101-924-	0.02 μ F ceramic
C224	1-102-964-	36 pF ceramic
C225	1-105-837-12	0.022 μ F mylar
C226	1-107-088-	130 pF silvered mica
C227	1-107-080-	62 pF silvered mica
C228	1-107-080-	62 pF silvered mica
C229	1-107-068-	20 pF silvered mica
C230	1-107-076-	43 pF silvered mica
C231	1-107-077-	47 pF silvered mica
C232	1-107-084-	91 pF silvered mica
C233	1-107-087-	120 pF silvered mica
C234	1-107-077-	47 pF silvered mica
C235	1-107-080-	62 pF silvered mica
C236	1-107-070-	24 pF silvered mica
C237	1-107-061-	10 pF silvered mica
C238	1-107-070-	24 pF silvered mica
C239	1-107-081-	68 pF silvered mica
C240	1-107-066-	16 pF silvered mica
C241	1-107-070-	24 pF silvered mica
C242	1-107-061-	10 pF silvered mica
★ C243		0.5 pF - 10 pF silvered mica
C244	1-101-924-	0.02 μ F ceramic
C245	1-105-661-12	0.001 μ F mylar
C246	1-103-610-	240 pF polystyrene
C247	1-103-601-	100 pF polystyrene
C248	1-103-661-12	0.001 μ F mylar

Ref. No.	Part No.	Description
C249	1-103-618-	510 pF polystyrene
C250	1-103-601-	100 pF polystyrene
C251	1-103-622-	750 pF polystyrene
C252	1-103-618-	510 pF polystyrene
C253	1-103-601-	100 pF polystyrene
C254	1-103-618-	510 pF polystyrene
C255	1-103-608-	200 pF polystyrene
C256	1-103-601-	100 pF polystyrene
C257	1-103-618-	510 pF polystyrene
C258	1-103-608-	200 pF polystyrene
C259	1-103-601-	100 pF polystyrene
C260	1-103-616-	430 pF polystyrene
C261	1-103-605-	150 pF polystyrene
C262	1-103-601-	100 pF polystyrene
C263	1-103-613-	330 pF polystyrene
C264	1-103-608-	200 pF polystyrene
C265	1-103-601-	100 pF polystyrene
C266	1-103-608-	200 pF polystyrene
C267	1-103-608-	200 pF polystyrene
C268	1-103-608-	200 pF polystyrene
C269	1-103-608-	200 pF polystyrene
C270	1-103-601-	100 pF polystyrene
C271	1-103-601-	100 pF polystyrene
C272	1-107-072-	30 pF silvered mica
C273	1-101-924-	0.02 μ F ceramic
C274	1-101-924-	0.02 μ F ceramic
C275	1-101-924-	0.02 μ F ceramic
C276	1-107-077-	47 pF silvered mica
C277	1-101-924-	0.02 μ F ceramic
C278	1-101-924-	0.02 μ F ceramic
C279	1-107-061-	- discarded -
C280	1-107-061-	- discarded -
C281	1-121-398-	10 μ F 25V electrolytic
C301	1-105-677-12	0.022 μ F mylar
C302	1-105-677-12	0.022 μ F mylar
C303	1-105-677-12	0.022 μ F mylar
C304	1-103-611-	270 pF polystyrene
C305		- discarded -
C306	1-101-959-	10 pF ceramic
C307		- discarded -
C308	1-103-613-	330 pF polystyrene
C309	1-105-677-12	0.022 μ F mylar
C310	1-103-636-	3,000 pF polystyrene
C311	1-103-610-	240 pF polystyrene
C312	1-101-959-	10 pF ceramic
C313		- discarded -
C314	1-101-959-	10 pF ceramic
C315	1-101-924-	0.02 μ F ceramic
C316	1-101-924-	0.02 μ F ceramic
C317	1-103-618-	510 pF polystyrene
C318	1-105-683-12	0.068 μ F mylar
C319	1-103-613-	330 pF polystyrene
C320	1-103-627-	1,200 pF polystyrene
C321		- discarded -
C322	1-103-614-	360 pF polystyrene
C323	1-101-959-	10 pF ceramic
C324	1-103-605-	150 pF polystyrene
C325	1-103-625-	1,000 pF polystyrene

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	
C326	1-105-677-12	0.022 μ F	mylar
C327	1-105-673-12	0.01 μ F	mylar
C328	1-105-677-12	0.022 μ F	mylar
C329	1-121-347-	10 μ F 16V	electrolytic
C330	1-105-677-12	0.022 μ F	mylar
C331	1-105-677-12	0.022 μ F	mylar
C332	1-105-677-12	0.022 μ F	mylar
C333		- discarded -	
C334		- discarded -	
C335		- discarded -	
C336	1-105-677-12	0.022 μ F	mylar
C337	1-121-347	10 μ F 16V	electrolytic
C338	1-121-347	10 μ F 16V	electrolytic
C339	1-103-605	150 pF	polystyrene
C340	1-101-880-	47 pF	ceramic
C341	1-105-677-12	0.022 μ F	mylar
C342	1-101-872-	33 pF	ceramic
C343	1-105-677-12	0.022 μ F	mylar
C344	1-105-677-12	0.022 μ F	mylar
C345	1-101-187	3 pF	ceramic
C346		- discarded -	
C347	1-105-677-12	0.022 μ F	mylar
C348	1-101-864-	20 pF	ceramic
C349		- discarded -	
C350	1-105-677-12	0.022 μ F	mylar
C351	1-101-177	2 pF	ceramic
C352		- discarded -	
C353	1-105-677-12	0.022 μ F	mylar
C354	1-105-677-12	0.022 μ F	mylar
C355	1-103-608-	200 pF	polystyrene
C356	1-103-608-	200 pF	polystyrene
C357	1-103-608-	200 pF	polystyrene
C358	1-121-347-	10 μ F 16V	electrolytic
C359	1-105-677-12	0.022 μ F	mylar
C360	1-105-681-12	0.0047 μ F	mylar
C361	1-105-673-12	0.01 μ F	mylar
C362	1-105-673-12	0.01 μ F	mylar
C363	1-105-673-12	0.01 μ F	mylar
C364	1-121-291-	100 μ F 6.3V	electrolytic
C365	1-127-022	0.5 μ F 10V	electrolytic (alox)
C366		- discarded -	
C367	1-103-613-	330 pF	polystyrene
C368	1-101-882-	51 pF	ceramic
C369	1-121-420-	220 μ F 16V	electrolytic
C370		- discarded -	
C371	1-101-884-	56 pF	ceramic
C372	1-121-186-	1,000 μ F 16V	electrolytic
C373	1-105-677-12	0.022 μ F	mylar
C374	1-105-677-12	0.022 μ F	mylar
C375	1-101-924-	0.02 μ F	ceramic
C376	1-101-924-	0.02 μ F	ceramic
C377	1-101-924-	0.02 μ F	ceramic
C378	1-101-924-	0.02 μ F	ceramic
C379	1-101-861-	15 pF	ceramic
C380	1-101-177-	2 pF	ceramic
C401	1-121-426-	470 μ F	electrolytic
C402	1-121-726-	0.47 μ F 10V	electrolytic
C403	1-121-726-	0.47 μ F 10V	electrolytic
C404	1-105-665-12	0.0022 μ F	mylar

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	
C405		- discarded -	
C406	1-105-679-12	0.033 μ F	mylar
C407	1-105-681-12	0.047 μ F	mylar
C408	1-105-685-12	0.1 μ F	mylar
C409	1-121-725-	0.47 μ F 10V	electrolytic
C410	1-121-356-	100 μ F 16V	electrolytic
C411	1-121-347-	10 μ F 10V	electrolytic
C412	1-103-608-	200 pF	polystyrene
C413	1-105-669-12	0.0047 μ F	mylar
C414	1-121-294	220 μ F 3.15V	electrolytic
C415	1-121-356-	100 μ F 16V	electrolytic
C416	1-121-426-	470 μ F 16V	electrolytic
C417		- discarded -	
C418	1-108-243-	0.022 μ F	mylar
C419	1-103-601-	100 pF	polystyrene
C420	1-105-717-12	0.022 μ F	mylar
C421	1-105-717-12	0.022 μ F	mylar
C422	1-105-661-12	0.001 μ F	mylar
C501	1-115-071-	0.0047 μ F 600V	paper
C502	1-115-071-	0.0047 μ F 600V	paper
C503	1-121-186-	1,000 μ F 16V	electrolytic
C601		- discarded -	
C602	1-105-679-12	0.022 μ F	mylar
C603	1-101-924-	0.02 μ F	ceramic
C604	1-121-391-	1 μ F 50V	electrolytic
CV1 1-4	1-151-158-12	capacitor, fm tuning, 4 gang	
CV201-1			
CV202 2	1-151-167-21	capacitor, sw tuning, 2 gang	
CV301 1			
CV301 2	1-151-182-135	capacitor, lw/mw/swl tuning, 3 gang	
CV303 1			
CT1-1	1-141-022-	capacitor, fm trimmer 4 gang	
CT1-4			
CT201	1-141-078-	capacitor, sw trimmer (16 pF)	
CT202	1-141-078-	capacitor, sw trimmer (16 pF)	
CT203	1-141-078-	capacitor, sw trimmer (16 pF)	
CT204	1-141-078-	capacitor, sw trimmer (16 pF)	
CT205	1-141-078-	capacitor, sw trimmer (16 pF)	
CT206	1-141-078-	capacitor, sw trimmer (16 pF)	
CT207	1-141-078-	capacitor, sw trimmer (16 pF)	
CT208	1-141-078-	capacitor, sw trimmer (16 pF)	
CT209	1-141-078-	capacitor, sw trimmer (16 pF)	
CT210	1-141-078-	capacitor, sw trimmer (16 pF)	
CT211	1-141-078-	capacitor, sw trimmer (16 pF)	
CT212	1-141-078-	capacitor, sw trimmer (16 pF)	
CT213	1-141-078-	capacitor, sw trimmer (16 pF)	
CT214	1-141-078-	capacitor, sw trimmer (16 pF)	
CT215	1-141-078-	capacitor, sw trimmer (16 pF)	
CT216	1-141-078-	capacitor, sw trimmer (16 pF)	
CT217	1-141-078-	capacitor, sw trimmer (16 pF)	
CT218	1-141-078-	capacitor, sw trimmer (16 pF)	
CT301-1	1-141-015-12	capacitor, a-m trimmer 3 gang	
CT301-2			
CT301 3			
CT302	1-141-082-11	capacitor, trimmer (20 pF)	
CT303	1-141-082-11	capacitor, trimmer (20 pF)	
CT304	1-141-082-11	capacitor, trimmer (20 pF)	
CT305	1-141-082-11	capacitor, trimmer (20 pF)	

Ref No.	Part No.	Description
CT306	1-141-082-11	capacitor, trimmer (20pF)
CT307	1-141-082-11	capacitor, trimmer (20pF)
CT308	1-141-082-11	capacitor, trimmer (20pF)
CT309	1-141-082-11	capacitor, trimmer (20pF)
CT310	1-141-082-11	capacitor, trimmer (20pF)

RESISTORS

- Resistors listed below are $\frac{1}{16}$ W, 5%, carbon resistors, unless otherwise noted.
- Resistors marked * are selected in value to yield specified operating condition. Refer to the voltage and current adjustment on page 19.

R101	1-208-027-	560 Ω	$\frac{1}{16}$ W ceramic
R102	1-208-027	560 Ω	$\frac{1}{16}$ W ceramic
R103	1-244-697-	10 k Ω	
R104	1-244-697-	10 k Ω	
R105	1-208-045-	3,300 Ω	$\frac{1}{16}$ W ceramic
R106	1-208-145-	100 k Ω	$\frac{1}{16}$ W ceramic
R107	1-208-145	100 k Ω	$\frac{1}{16}$ W ceramic
R108	1-208-088-	200 k Ω	$\frac{1}{16}$ W ceramic
R109	1-208-027-	560 Ω	$\frac{1}{16}$ W ceramic
R110	1-208-033	1 k Ω	$\frac{1}{16}$ W ceramic
R201	1-244-653	150 Ω	
R202	1-244-656-	200 Ω	
R203	1-244-684-	3 k Ω	
R204	1-244-680-	2 k Ω	
R205	1-244-677-	1,500 Ω	
R206	1-244-688-	4,300 Ω	
R207	1-244-679	1,800 Ω	
R208	1-244-671	820 Ω	
R209	1-244-669	680 Ω	
R210	1-244-666-	510 Ω	
R211	1-244-663-	390 Ω	
* R212	1-221-638-12	100 k Ω	adjustable
R213	1-244-704-	20 k Ω	
R214	1-244-657-	220 Ω	
R215	1-244-688-	4,300 Ω	
R216	1-244-690-	5,100 Ω	
R217	1-244-661-	330 Ω	
R218	1-244-669-	680 Ω	
R301	1-242-705-	22 k Ω	
R302	1-242-690-	5,100 Ω	
R303	1-242-673-	1 k Ω	
R304	1-242-639-	39 Ω	
R305	1-242-664-	430 Ω	
R306	1-242-710-	36 k Ω	
R307	1-242-642-	51 Ω	
R308	1-242-708-	30 k Ω	
R309	1-242-673-	1 k Ω	
R310	1-242-673-	1 k Ω	
R311	1-242-656-	200 Ω	
R312		- discarded -	
* R313	<div> 1-242-697- 1-242-699- 1-242-701- 1-242-703- 1-242-704- </div>	<div> 10 kΩ 12 kΩ 15 kΩ 18 kΩ 20 kΩ </div>	

Ref No.	Part No.	Description
R314	1-242-727	180 k Ω
R315	1-242-673-	1 k Ω
R316		discarded
R317	1-242-673	1 k Ω
R318	1-242-673-	1 k Ω
R319	1-242-673-	1 k Ω
R320	1-242-665-	470 Ω
R321	1-242-665-	470 Ω
R322	1-242-665	470 Ω
R323	1-242-684	3 k Ω
R324	1-242-671-	820 Ω
R325	1-242-666-	510 Ω
R326	1-242-683-	2,700 Ω
R327	1-242-680-	2 k Ω
R328	1-242-714	51 k Ω
R329	1-242-677	1,500 Ω
R330	1-242-708-	30 k Ω
R331	1-242-712-	43 k Ω
R332	1-242-722-	110 k Ω
R333	1-242-642-	51 Ω
R334	1-242-697-	10 k Ω
R335	1-242-665-	470 Ω
R336	1-242-673-	1 k Ω
R337	1-242-721-	100 k Ω
* R338	1-242-720-	91 k Ω
	1-242-721-	100 k Ω
	1-242-722-	110 k Ω
	1-242-723-	120 k Ω
	1-242-724-	130 k Ω
* R343	1-242-725	150 k Ω
	1-242-726	160 k Ω
R339	1-242-642	51 Ω
R340	1-242-660-	300 Ω
R341	1-242-683-	2,700 Ω
R342	1-242-683-	2,700 Ω
* R343	1-242-672-	910 Ω
	1-242-673-	1 k Ω
	1-242-674-	1,100 Ω
	1-242-675-	1,200 Ω
	1-242-676-	1,300 Ω
* R343	1-242-677-	1,500 Ω
	1-242-679-	12 k Ω
R345	1-242-665-	470 Ω
R346	1-242-701	15 k Ω
R347	1-242-710-	36 k Ω
R348	1-242-668	620 Ω
R349	1-242-697-	10 k Ω
R350	1-242-657-	220 Ω
R351	1-242-649-	100 Ω
R352		discarded
R353	1-244-656	200 Ω
R354	1-242-708-	30 k Ω
R355	1-242-701-	15 k Ω
R356	1-242-656-	10 k Ω
R357	1-242-657-	220 Ω
R358	1-242-665	470 Ω
R359	1-242-673-	1 k Ω
R360	1-242-694-	7,500 Ω

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R361	1-242-694-	7,500Ω
R362	1-242-673-	1 kΩ
R363	1-242-673-	1 kΩ
R364	1-242-731-	270 kΩ
R365		discarded
R366	1-242-673-	1 kΩ
R367	1-242-666-	510Ω
R368	1-242-690-	5,100Ω
R369	1-242-670-	750Ω
	1-242-671-	820Ω
	1-242-672-	910Ω
	1-242-673-	1 kΩ
	1-242-674-	1,100Ω
	1-242-675-	1,200Ω
R370		discarded
R371		discarded
R372		- discarded -
R373		- discarded -
R374		discarded -
R375	1-242-656-	200Ω
R376	1-242-690-	5,100Ω
R401	1-242-727-	180 kΩ
R402	1-242-731-	270 kΩ
R403	1-242-693-	6,800Ω
R404	1-242-666-	510Ω
R405		discarded
R406	1-242-690-	5,100Ω
R407	1-242-677-	1,500Ω
R408	1-242-701-	15 kΩ
R409	1-242-673-	1 kΩ
R410	1-242-697-	10 kΩ
R411	1-242-728-	200 kΩ
R412	1-242-684-	3 kΩ
R413	1-242-686-	3,600Ω
R414	1-242-645-	68Ω
R415	1-242-721-	100 kΩ
R416	1-242-680-	2 kΩ
R417	1-242-659-	270Ω
R418	1-242-627-	12Ω
R419	1-242-643-	56Ω
R420	1-242-659-	270Ω
R421	1-242-671-	820Ω
R422	1-242-659-	270Ω
R423	1-242-671-	820Ω
R424	1-210-154-	1.5Ω 1W carbon
R425	1-210-154-	1.5Ω 1W carbon
R426		discarded -
R427	1-209-154-	33Ω 1W carbon
R428	1-242-647-	82Ω
R429	1-242-690-	5,100Ω
R501	1-210-173-	43Ω 1W carbon
R502	1-244-618-	51Ω
R503	1-202-645-	1 MΩ ½W composition
R504	1-210-173-	43Ω 1W carbon
R601		- discarded

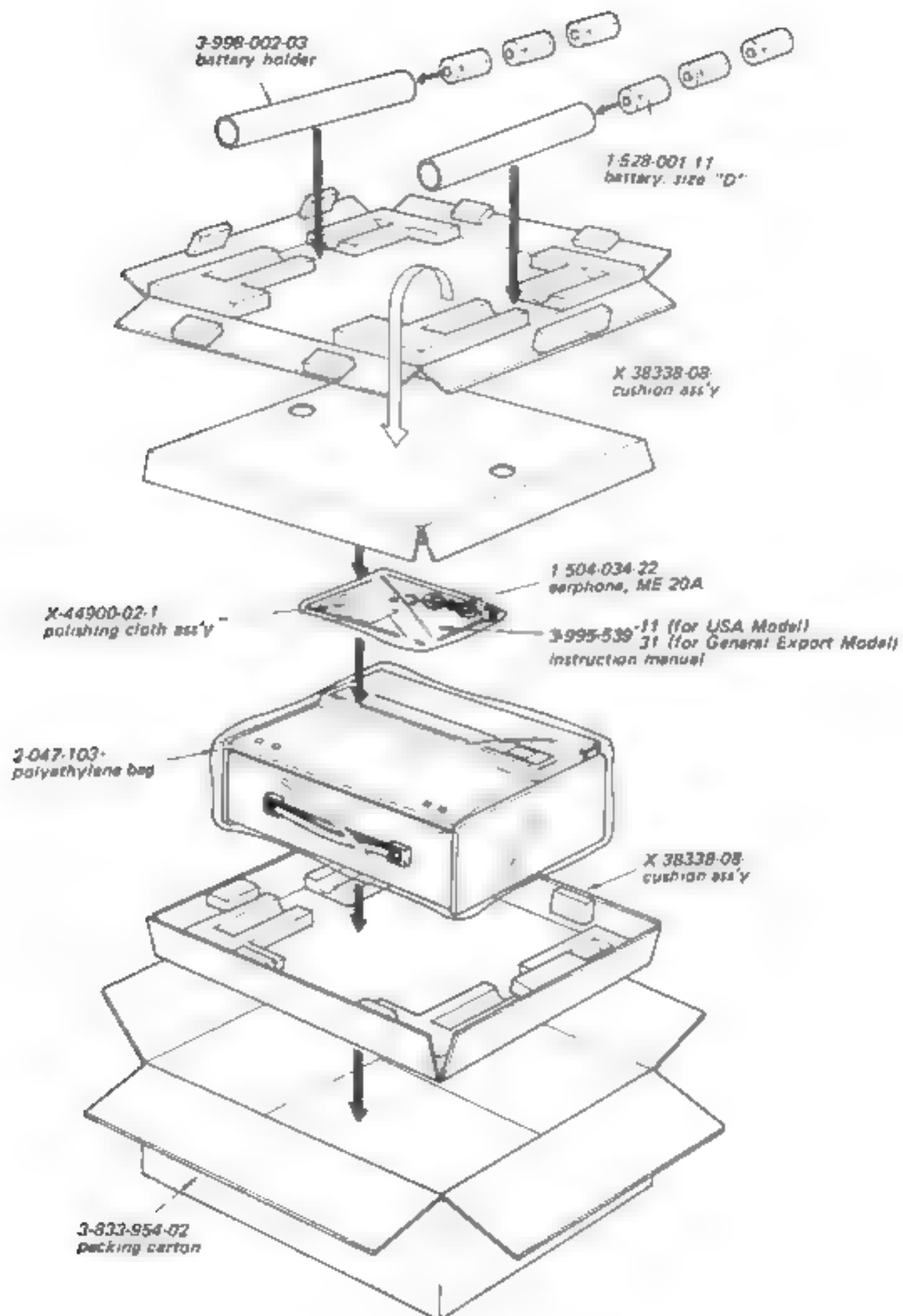
<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
R602		- discarded -
R603		- discarded -
R604	1-244-719-	82 kΩ
R605	1-244-673-	1 kΩ
RV601	1-222-218-	volume control 50 kΩ
RV602	1-222-126-	tone control 50 kΩ, treble
RV603	1-222-126-	tone control 50 kΩ, bass

MISCELLANEOUS

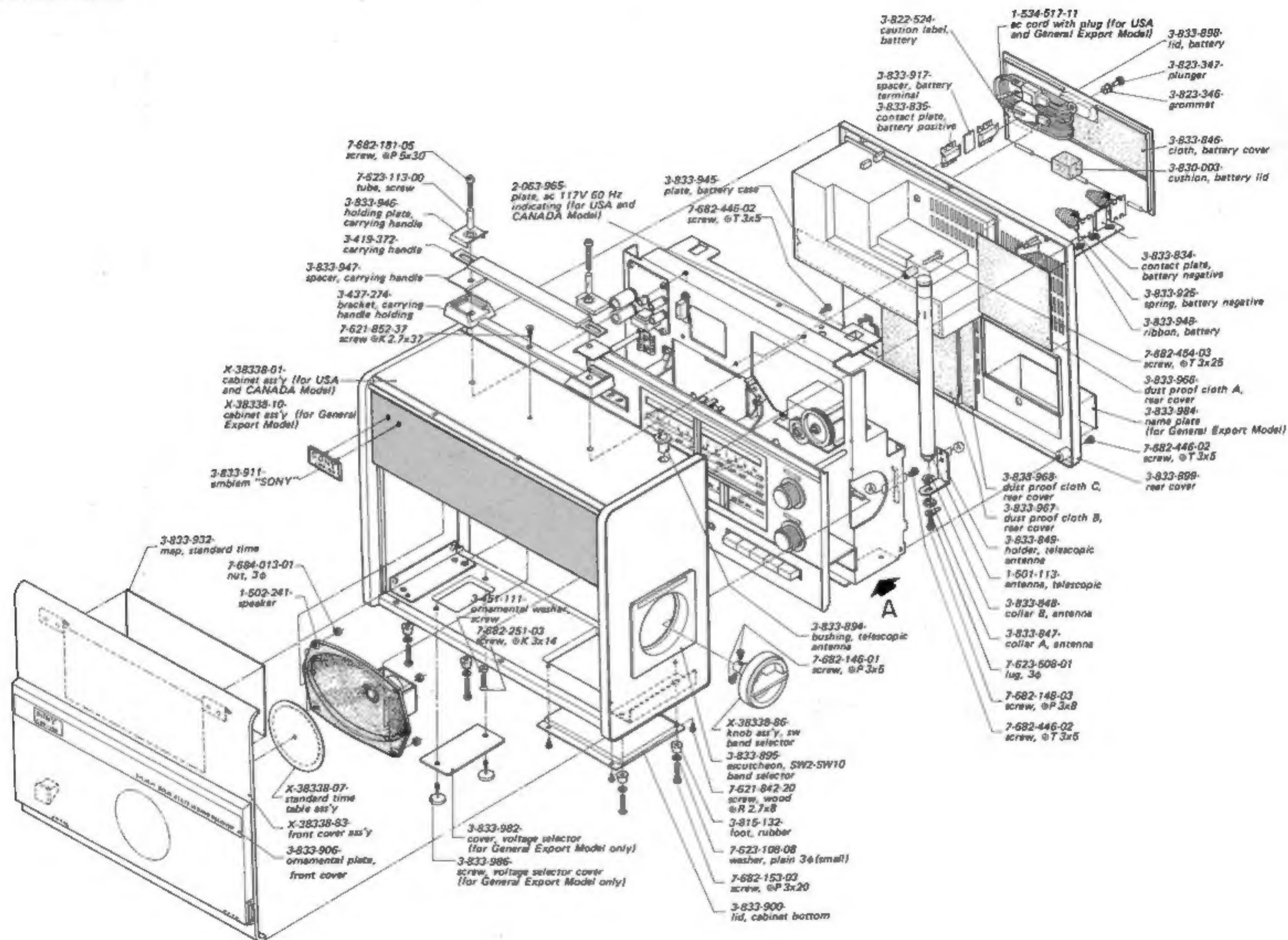
Y 38519-11-1	fm tuner block, FMC-094W1
Y-38712-01-1	sw tuner block, SWC-021D1
1-539-252-12	printed circuit board, cp/f-f
1-539-253-11	printed circuit board, af
1-539-254-11	printed circuit board, power supply
ROD601	1-501-113-
S201 205	antenna, telescopic
	SW2-SW10 band selector,
	assembled in sw tuner
S301 305	1-514-670-
S306	1-514-594-11
S501	1-514-503-11
	5 key switch, band selector
	push switch, SELECTIVITY
	lever seesaw switch,
	power ON-OFF
S502	1-514-269-
S503	1-514-503-
S504	1-514-421-31
S601	1-514-304-
S602	1-514-304-
J501	1-509-362-11
J601	1-507-169-13
J602	1-507-169-13
J603	1-507-169-13
J604	
	discarded -
J605	1-507-169-13
J606	1-506-119-
J606	1-507-148-
SP601	1-502-241-11
PL601	1-518-006-03
PL602	1-518-006-03
PL603	1-518-006-03
PL604	1-518-006-03
PL605	1-518-006-03
V5501	1-526-168-
	voltage selector
	(for USA and CANADA model)
V5501	1-526-188-
	voltage selector
	(for general export model)
	1-520-195-
	tuning meter
	1-534-517-11
	ac cord with plug
	(for USA and general export model)
	1-534-517-12
	ac cord with plug
	(for CANADA model)
	1-507-901-12
	nut, earphone jack
	1-536-179-
	lug terminal
	1-536-180-
	lug terminal (C-2L2)
	1-536-178-
	plate, lug (C-1L)

SECTION 6 PACKING AND EXPLODED VIEW

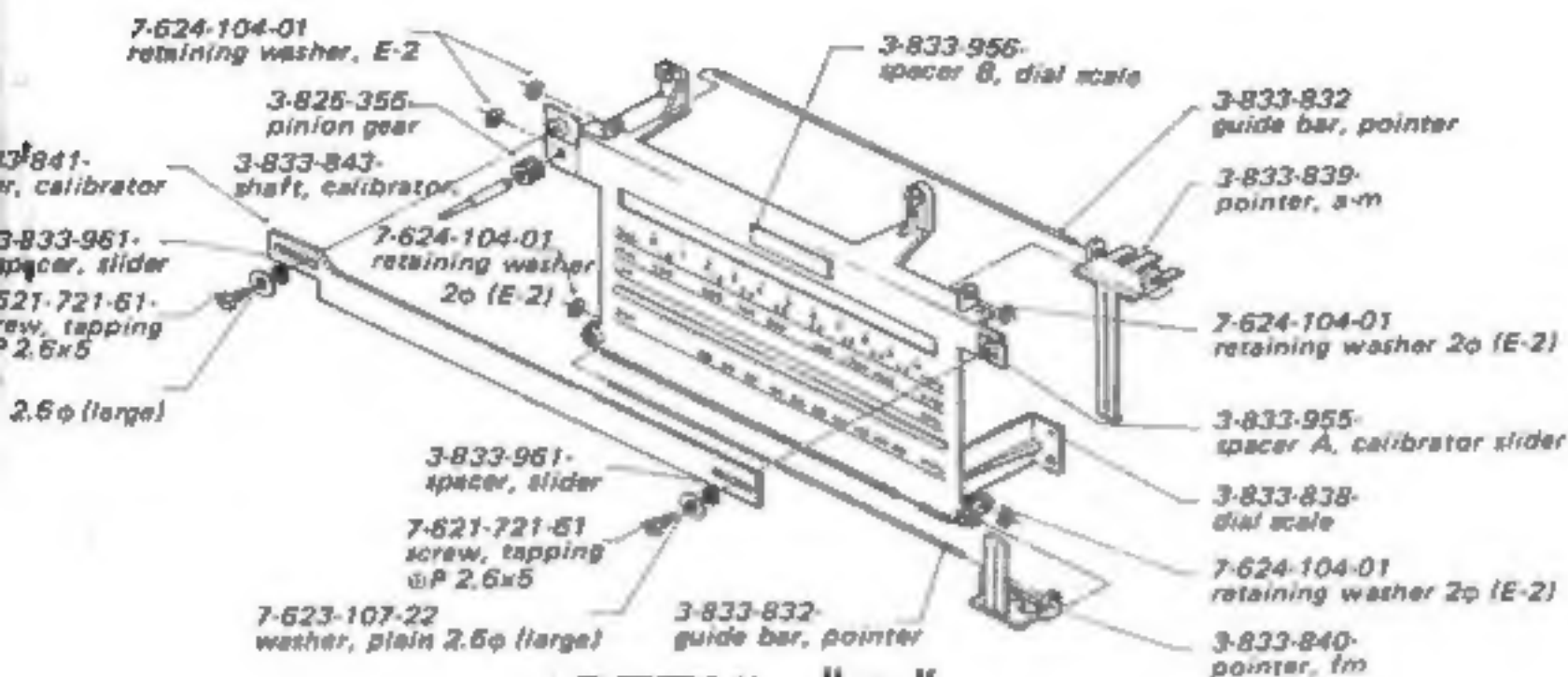
6-1. PACKING



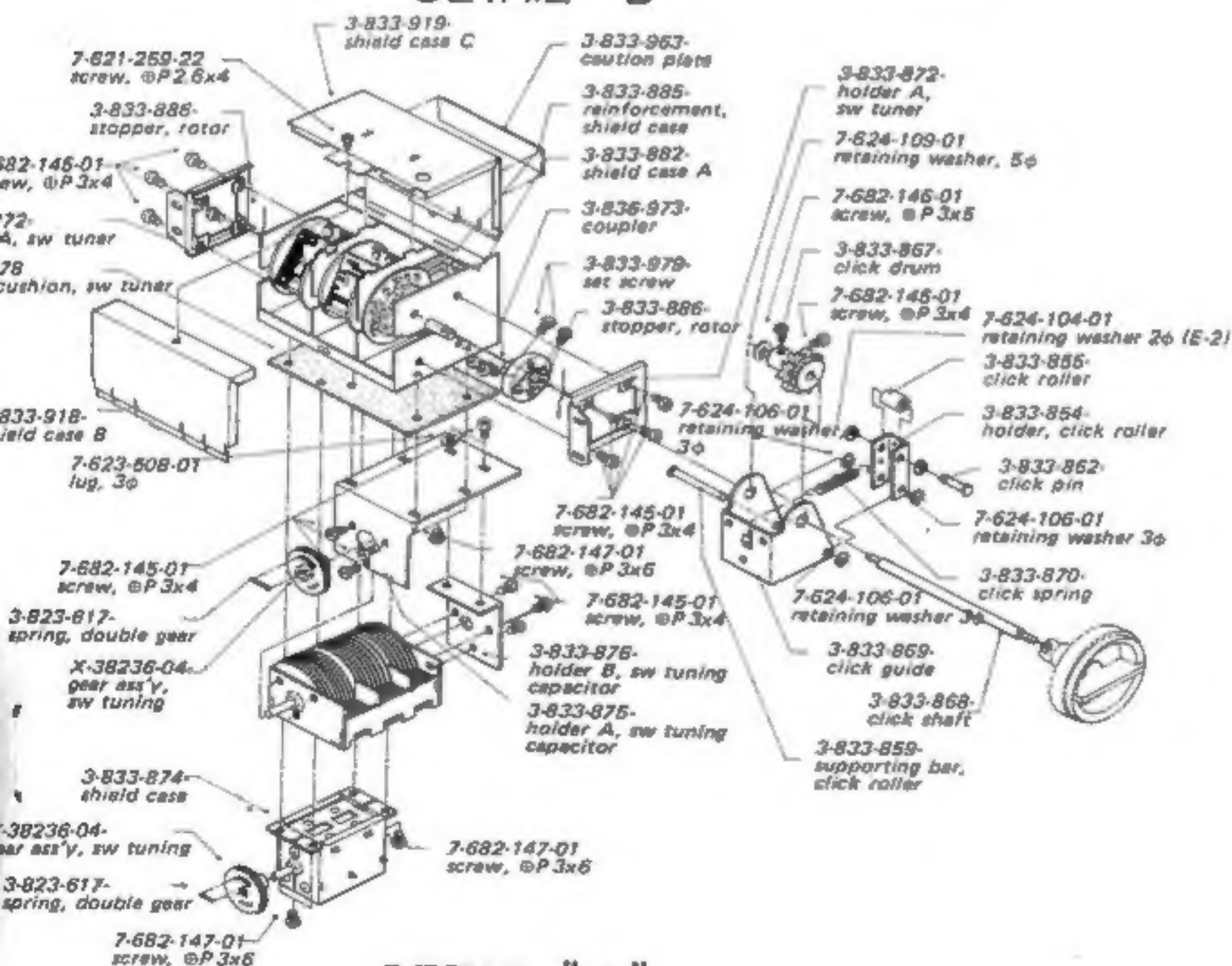
6-2. EXPLODED VIEW (1)



EXPLODED VIEW (3)



DETAIL "B"



DETAIL "C"

